

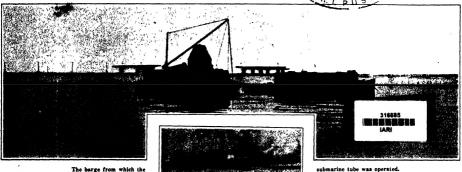
AGRICULTURAL RESEARCH INSTITUTE
PUSA

# MURRISH SIXTY-NINTH YEAR MINISTER

## THE WEEKLY JOURNAL OF PRACTICAL INFORMATION

NEW YORK, JULY 5, 1913.

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The barge from which the



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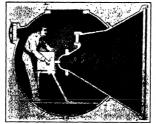
VOLUME CEK.

A copy of the Scientific American was lewered to the bottom of Hampton Roads and photographed.





ulpment designed to take moving pictures under



rating chamber to be built for taking moving pictures under water of marine life.



nson, the photographer, of



Minnows nibbling at bait. Inexperienced fishermen will now understand what becomes of their bait.



stograph of a pile made under water, a strik-ing proof of the ravages of worms.

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## SCIENTIFIC AMERICAN

#### NEW YORK, SATURDAY, JULY 8, 1913

hed by Munn & Co., Incorporated — Charles Allen Munn Pr Fre lerick Couverse Bosoh, Secretary and Tressurer all at 351 Broad way, New York

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## Munn & Co., Inc., 361 Broadway, New York

The Editor is always gind to receive for examination illustrated articles on subjects of timely interest. If the photographs are morp, the articles fund, and the facts authorite, the contributions will receive special allention. Accepted articles will be paid for al regular space rates.

The purpose of this journal is to record accurately, simply, and litterestingly, the teath's progress in sever tife knowledge and industrial achievement.

#### Nature Completes the Panama Canal

THE closing of the states gates at the Gatun Spillway on July 1st may be regarded as the flux! step taken by our engineers in the great work of providing an artificial deep-draught waterway be tween the Atlantic and the Pacific. It is for nature to During the pext four months the turbulent Chagres River and the lesser streams of the Panami Congress server and the losser streams of the Panama district will pour their waters into a widespread valley from which there is no outlet. Shut in by the tatum Dam at the north and the upper lock gates of Pedro Mignel to the south, the surface of Gatua Lake will rise luch by inch and foot by foot. Its ever-wideling area will creep silently up the converging valleys until the lake has risen to its working level of eighty-five feet above the mean tide level of both oceans, at which a vast artificial inland sea of fresh water will have been formed with a total surface area of neath

one hundred and seventy square miles.

There is a certain flavor of poetry and romance in the greater works of engineering, especially in those of a civil character—as every visitor to the Capal during struction must have realized before he had g to construction must have realized nector are mad going very far over the work. There is something that appeals to the imagination and even to our sense of the dramutic in contemplating the thought that the Chagres River which at the outset of operation was regarded as the most serious problem confronting the canal builder, the most stubborn enemy to his prog-ress, is to-day his best friend, and under his guiding hand is putting the fluishing touch to this stopendou

Incidentally, in the harnessing of the Chagres River, our engineers will greatly facilitate their struggle against that other great natural obstnele to the Canal completion, the slides at the Culebra cut; for with the of the lake it will become possible to fic cut, and locate at the most troublesome point of sild ing the two extremely powerful dredges which are now approaching completion for the istimbut thank Comunission. These dredges with their monthly capacity of 2,000,000 yards will probably be able completely to control the situation and take out the sliding material control the struction and take on the strong materials as fast as it comes in, and at a cost far helow that possible with steam showers. Furthermore, their great capacity makes it certain that such sides as man from time to time occur during the operation of the Canal will never become so serious as to hinder the flow of

#### Reversing the Locomotive

THERE are some popular technical fullactes strongly entrouched in public belief that the survive in spite of reiterated contradiction.

Among these is the belief that the first thing a locome three does or one of the first when he sees that a collision is inevitable is to apply the brakes and

exercise an engine.

As a matrix of fact, we doubt if one in ten thousand of the locomoduse engineers of this country would be guitty of the aspundity of reversible libs counts would be guitty of the aspundity of reversible libs counted and applying his brates at the same time. There was a day in the earlier factors of sufficiently, after an engineer would have been smallered paints in his duties if he

did not in nh emergency reverse his engine; but with the growth of technical knowledge it has come to be understood that to reverse the engine after applying the brakes is to defant the very object for which the train brakes are applied.

train brakes are applied.

In justice to the early locomotive engineers, however, it should be remembered that only the tender of the horomutive carried brakes, not the engine itself; and under those conditions the reversing of the engine appiled an additional though comparatively small retard-ing effect, supplemental to that afforded by the tender

brakes. We refer to this matter in, conjunction with the in-telligent letter which we publish in our correspondence columns, from which it is evident that our editorial of June 21 is linkle to be inscensired. Aur reference to the necessity for quick control of the revealing gear was not intended to course, the idea that the Scizz-TIPIC AMERICAN advocated the reversing of the engine when the engine brakes were applied. In saying:
"Only a stop which would reverse the power would be of any service when air brakes proved inoperative at crucial moments," we were pointing out that should the air brakes fall entirely, as it is claimed they did in the Stamford collision, the only thing left for the engi-ueer to do would be to reverse. This would have some effect, though retardation due to the locking and sliding of the wheels on the rail w ould have an insignificant effect upon the momentum of the whole train.

The folly of reversing when there are brakes on the eughie and these brakes are set is evident if we remember that, when the engine is running with the brakes d, the retarding effect is due to the large gate aren of contact between the brake shoes and the trend of the wheels; whereas, when the engine is re-versed, the frictional area of the bruke shoes is replaced by the very small area of the sliding surfaces in con-tact between the tread of the wheels and the rails with the result that there is an immediate large reduc tion of the retarding effect of the engine on the trein behind it

#### The Problem of Marine Oil Engines for Ocean Liners

HE constructive optimism with is so valuable an asset in the development of new inventions frequently leads to their application on a scale frequently leads to their application on a scale which is not guaranteed by the actual practical development of the art. It begins to look as though the stallation of exclusive Diesel engine and other engine plants of large powers in bir ocean stemaships was a case in point. We say this with the full appreciation of the fact that the work of the German engineers in this direction has been both brilliant and marked by a lavish expenditure of brains, time and money. Although the leading build or large unrine oil engines are not discouraged, they realize that a large amount of research and experi-mental work must be accomplished before oil engines can be built in sizes much larger than the largest that are now in service. The difficulties are chiefly those which arise from s evere temperature stresses, and from

the complicated valve mechanism.

It is certain, then, that the large oil engine has b no means reached its flust stage of development; and we may look for some radical changes, particularly in the direction of simplifying the main constructive ele-ments of the oil cuglin, in reducing the number of its

mixed plant of steam turbines and oil engines mived point of steam turnines may on engines, susas, as a powerful oil engine on a central shaft with steam turbines driving the wing propellers.

Let it be clearly understood that the above is written

with the problem of the oil-motor-driven battleship and liner in mind. In the smaller powers the success has liner in mind. In the smaller powers the success has been so marked as to render certain a very large displacement of steam by heavy oil Furthermore, some of the problems which complicate the question of large pawer milts on the sea--say, of from 10,000 to 12,000 inter-power-are not so serious when the plant to deskined for stationary service on land; and here we have been a start of the rends there were services as the state of the rends there were services as the state of the rends there were services as the state of the rends there were services as the rends there were services as the state of the rends there were services as the state of the rends there were services as the rends there are the rends there are the rends there are the rends there are the rends that the rends there are the rends there are the rends that the rends there are the rends that the rends there are the rends that the rends that the rends there are the rends that the rends tha may look for a steady if not rapid increase in dimer slone and nowers.

#### Bombarding a Defense With Dirigibles

HE aspect of a huge rigid airship of the Zeppelin type, 500 feet in length, of 25,000 cubic meters capacity, capacity, capable (as ther soon will be) of attaining a speed of 70 miles per hour, carrying machinerums, both in the care below the envelope and on a platform on top, and transporting u load of 8 to 10 tons, with a range of action of 8,000 miles, and implying the menace of the release of half a ton or more of explosives at one "drop" on dock gath, remain; ship, is extremely formidable. When one of that the dirighble one travel at night, and grows with stop of engines over the target which is tended to destroy, the memore is more series and

There is, however, another side to the ass the first place these large atrables are vary to handle near the ground and once state; a there until they can return to their special sh cannot ride out a storm at anchor, but must elth to drive through it on their return from a vorage which is a risky proceeding if the wind is centrary, or they must drift and lose ground and be driven are away from their shelter. Their supply of freely in awny from their sheller. Iner supply of free initial, so that in either case they man have, to sin up, and once it is exhausted to are cooked to struction. If they carry explosive they have the their fuel reserve

Secondly, the airship, as an engine of war, and not Secondly, the airsulp, as an engine or war, and any merely a means of reconnolssance, has yet to present its value. Mr. Hudson Maxim declared some came said in a lecture to the Brooklyn Aeronautical Association. that a high explosive which should be so powerfur destructive when employed in aerial bombs as to to the expectations and predictions of the scarcemons. could not be made; even dynamite to do much Gamage required to be confined. The destructive power of shells d torpedoes is undoubtedly enormous d that the conditions are favorable, but great as the average man supposes, especially if he has been through a short course of blood-curding aerial fiction.

The effects of the battering of modern heavy navel guns on a battleship and its crew, as described witnesses on board Russian vessels in the Bass witnesses on board Russian vessels in the Russo-Jupaine en war, are impressive to a degree, but the shelfs in such a case are directed with anormous propulsive force from rifled gums against solidly resistant such curses of wood and metal, not merely dropped from a considerable height to the earth, among buildings. Experiments with dropped live shells and explosives have shown that while they might land within a remarkably short distance of the target, I was just had finkancy which made all the difference in the resulting demans, for the ofference of the residence and the same of the sam

that the damage, for the effects of high explosives are very local and the momentum attained by any heavy object failing from a considerable beight is such that it buries itself in the ground and the force of the explosion caused by a percussion fuse is thereby neu-tralized. This does not imply that bombardment from aerial machines would be entirely ineffectual, but 4f we may judge from the analogy of the results within ory of man of artillery practice against towns the memory of man of artillery practice against towns and villages, it would not be worth the expenditure of time, energy and ammunition, nor the riskt of life involved. Ladyunith stood the bettering affects of twenty odd thousand shells with practically no damages. Nimilar results attended the bombardment of the forter round Pretoria, and lyddite shells, though they dog cavities and made openings in the walls of the Pierrish fort outside Omdurman, did little or no real damage. In none of these cances was the bösinbirdusent damage. In none of these cases was the bembard a factor compelling the surrender of the garrison.

Thirdly, the dirigible is notoriously a large and very vulnerable target for artillers, if it should descend to within 5,000 feet. That it would be difficult to hit while going at full speed cannot be doubted, but it cannot while similar truit speece cannot be doubted, but it cannot make use of its superiority over the acceptance as a platform for bomb dropping, unless it stops its engines and hovers vertically over the target at a sheight well within easy range of the guns. It is difficult to believe that the most practiced board-droppes could bit any of the smaller buildings, otherwise than by chause, from a height of 5,000 to 6,000 feet, and the gunner would have a good opportunity of brinking down the

from a height of 5.000 to 6.000 fast, and the gunner would have a good opportunity of beinging down the airship while it remained stationary.

It may be presumed, therefore, that the efforts of the diracible would be confined to reconnaisance by day with a view to marking down certain points for statick by night. "Whit a favering wind and under cover of darkness the pilot would subsequently endeavor to place himself in a position to drift sliestly, with stopped engines, until approximately over the chosen larget, the bearings of which would have been ascertained by reference to the man, sided possibly by enginess and the same of the second process of t

erest .

-German d of 7,000 tons disnoing gane. The reion, of a 12 days continuous test of the standardizes, in which 90 per our affects, described where so maintained the standardizes of the specific of the four while the standard of the Imperior? pic.

Mental Deviluement — It is a second

available for labor of the "Imperator" size.

Bender Received Thereforement.—Let reported that
four thing preside excisence are to be field down this
year of the Received reference are to be field down that
year of the Received efficient class is excisence, each
man being of action of Action class is excisenced, and
high solution of Action have been a labor to the
presidence of 76,000 horse-power. Also eight
torpusio-hast descriptors of the language size, similar
is design to the "Nevith" are being built, the
hitle its Essense and the turnings by the Vulcan
Complexy of Hamburg. These ships will be of
2,300 hour displacement and will be designed for
3 knots, The "Nevit" made 36 knots on trial
and is torday the features costs vessel affort.

child teiding the frastest consum vessel afont.

\*\*Ecrossie Biectite Bisil Coaches.—Rix railroad oars ditiven by electric motors supplied with surrent frem kerosene electric generating sets are being built by the British Westinghouse Company; one for the Cuban Central Railway, one for the London Northwesters Railway, three for the Nordmark Klasselforens Januagaktebolag, Denmark, and one for the New Zealand government. The engines used are of the str-cylinder typn, having a bore and stroke of 5½ by 6¼ inches, respectively, and developing 60 horse-power at 1,100 revolutions per minute. Kerosene is used as fuel by vaporising it in a G. C. vaporiser which displaces the erdinery muffler. Geseline is used for starting purposes until the vaporiser is heated.

Dissel Engine Tewbost.—The new towbost.

purposes until the vaporiser is heated.

Dissel Engine Tawbeat.—The new towboat:
"Savois." which is in use by the Italian navy, is noteworthy from the fact that it is equipped with Diesel oil engines. Though its displacement is only 170 tons it carries a 280 horse-power engine of the four-cylinder, two-cycle type. It runs at 280 revolutions per minute, and is started or reversed by the use of compressed air at a comparatively low pressure. A compressed air tank on hoard carries enough supply to furnish sixty starting or reverse operations, and these are said to take but a few seconds. Owing to those advantages, the new corft is a remarkably these advantages, the new craft is a remarkably easy one to handle.

easy one to handle.

Wedding Copper with the Oxy-acetylene Hama.—
A process of welding copper with the oxy-acetylene flame has been developed by a German inventor named Carl Canzier. He has found it necessary to use larger torches than for iron welding, but in general the process is similar, except that he employs a liquid welding paste, and a special copper welding wire. The paste prevents the formation of oxido. The process has been used for welding copper plates up to an into in thickness. The weld will withstand soid and its strength is could be that of a continuous solid course. is equal to that of a continuous solid copper sheet. The process is being used in the principal copper works in Germany with great success. Device for Testing the Hardness of Steel.—A very

Device for Testing the Hardasse of Steel.—A very simple device har recently been invented for testing the hardness of steel by impact. It countsts of a tabular standard fitted with a hardened steel ball at 'the lower end, which is placed upon the steel to be tested. At the upper end of the standard is a spirit level by which the standard may be brought to true vertical position. Mounted, on the standard is a cylindrical drop weight. This is raised to the top of the standard and then dropped, striking a weight-receiving block at fift bottom of the standard, which communicates the implect to the steel hall, and makes an indentation in the steel that is being tested. By measuring the diameter of the indiant-vicks with a celluloid scale the hardness of the steel tested. By measuring the diameter of the indicate tion with a celluloid scale the hardness of the stee - bonimed

may be determined: Ramburg:—As natural gas does not occur frequently in Garmany, the example pointed out by Dr. Strache of a gas well at Neusnaman and Strack of the Hamburg region, is secritly of resnark. The gas leaves the ground it help frequently in the Hamburg region, is secritly of resnark. The gas leaves the ground it high piecestry, showing 30 amoughness, it is said. The city of Hamburg leaving to make use of the gas, and is at precision beingsed in larging a pipe line in a to bring it for the several gas words, shows it will be mixed with could gas, to as to bring it for the supply off like he used in the copyright of the second of the gast well fined, and this will be several as the gast well fined, from secondary of this second is precised in delication; statical, and this will be several as the gast well fined.

The Weifure of University Students.—The Congress organized by the National Union of Students Associations was held at Paris during the month of May and was an eyest of considerable interest and numerous matters tending to promote the welface of university students were discussed. What is known as the International Pederation of Students is now being organized, and is intended to bring students of all nations into doner relations than before,

The Death of Fref. Verneuil.—We have to record the decease of the French scientist Verneuil, who occupied a leading position as professor of glass-making and ceramics. To him are due many interesting researches and practical methods in various fields. In connection with M. Wyrouboff, he carried on productive researches upon thorium and certum, and he acquired some colebrity for his work in artificial production of the ruby as well as in manufacture of optical glace.

The Congress of British and French Electrical Engineers.—An interesting event was the Congress of British and French electrical engineers which was held at Paris May 21st to 25th, on which occasion numerous members of the British Institution visited the capital and took part or the Britain institution visited the espital and took pair in the conferences, visits and receptions organized by the home institute. Papers were read upon electric traction, power production subjects and others, and the delegates visited the St. Denis and other large city plants, the visited the St. Denis and other large city plants, the Metropolitan sulpray and electric stations and various points of interest. M. Georges Claude gave a lecture upon luminescent tubes (neon tabes, etc.), and Com. Ferrie upon wiredows telegraphy, with special reference to the Riffel Tower plant. After visiting Versailes and the Bue seroplane grounds, the members returned to Paris by the effectie railroad. On the whole, the visiting members were quite pleased with their stay at the capital.

The Ascent of Mt. McKisley.—On June 7th, Archdesson Hudson Stuck, accompanied by Robert G. Tatum, Harry P. Kerstens and Walter Harper, reached the top of the south peak of Mt. McKisley. Barometric observations which were made by Dr. Stuck as said to indicate that the height of the mountain is 20,500 feet. The oxide the McKisley carly in McKisley carly in May, but was telaked to reach the Spmuit of Mt. McKisley carly in May, but was telaked three weeks in cutting a May, but was ticlayed three weeks in cutting a passage three thiles along ice, thrown across the ridge last summer by an earthquake.

ridge last summer by an earthquake.

The Casadian Arctic Expedition was definitely begun on June 17th, when the whaler "Karluk," commanded by Capt. Bartiett, and having on board ten of the scientific staff and a crew of fitees, sailed from Victoria, B. C. The leader of the expedition, Villishianus Steffanson, expectate to join the party at Nome, Alaska, about July 20th. At Nome, the expedition will divide into two sections, one of which, under Steffanson, will sail morth in the "Kartik" to seek the unknown lands supposed to exist on the poleward side of the Beaufort See, while the other, under Dr. R. M. Anderson, will proceed westward is the small suntilistry gasoline schooner "Alaska" and will endeavor to reach a base in southwestern Victoria lasad, from which point extensive explorations and investigations will be carried out. (Some preliminary plans of the expedition and a chart showing the proposed routes will be found in the Scientwister Camerica. SCIENTIFIC AMERICAN SUPPLEMENT of May 3rd,

Further Results of the Mawson Expedition.—
The experiency and schewements of Mr Frank Wild and his seven companions, who formed the second base of the Australasian Antarctic Expedition, have just been made public. After leaving Mawson and the main party at Addie Land, the second detachident sailed westward along the Antarctic coast, under orders to form a base on Sabrina Land or Knox Land. The farmer land was found not to crist, and ice prevented access to Knox Land. Finally the party was ianded. vas found not to exist, and toe prevented access to Knox Land. Finally the party was indeed to Knox Land. Finally the party was indeed to Knox Land. Finally the party was indeed will think was missisten by Wilkes for "Cremination Land," It was named "Shackloton Giseler." From this base surveys were made all along the coast from 101 degrees east longitude, on the east to the point reached by the German expedition of 1902 on the west, besides possertating inward—in one 918ce 50 miles. The main robust of these explorations was the discovery of a treat of land having 350 miles of coast, and probably estending, septit to the pole, which the explorers comment. Was present the pole, which the explorer polecy of Emperor penguisa heretelyors recorded. Some 7,000 young Emperor being was found to the exposition of the expedition's basides innumerable ordinary; penguing. The Mawon expedition as a whole; may be east to have requised in the accurate designation of about 1,000 miles of new coastline.

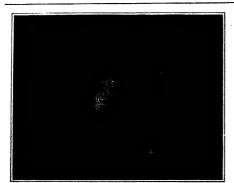
A Lucky Escape from a Hall Storm.—The Chalons district for twenty miles around Vitry le Pranços experienced a terrife hall storm early in the evening of May 9th. So violent and lengthy was the storm that the ground was covered to a depth of several indices with hall stones Many persons were injured and two military aviators who were returning from Rheims raced with the approaching storm and landed just as it broke. The aeroplanes were badly damaged by the hall and one of the pilots was indamaged by the hail and one of the pilots was injured. Although an aeroplane can fly in a pelting rain, it is doubtful if the machines in this instance would have descended safely if they had been ove taken while in flight by the hall storm.

Morean Anonymously Assisted.—An anonymous contribution of \$2,000 was lately received at the National Aerial League, at Paris, in order to enable Engineer Moreau to proceed with his accoplano method, in which he secures a remarkable stability. The value of his invention is now beginning to be recognized, but although he was able to proceed with his work by the aid of a private subscription, he was obliged to stop when this became exhausted. However, the French army is likely to take the mat-ter up soon, as it is claimed that the Moreau acroter up soon, as it is elaumed that the Morean aero-plane realizes a complete automate stability. In a recent flight made by Lieut Sulmer, the aeroplane was able to fly for 35 immutes in rather rough weather without having the pilot operate any of the steering parts. As M Morrau said he would do, he made the entire flight with folded arms, which appears to be a remarkable feat.

Sahara Flights.—A very successful aeroplane flight over the flosert of Sahara was recently made by four Farman biplanes mounted by French army pilots. What is noteworthy is that the trip, covering about 500 miles distance, was made above the desert region 500 miles distance, was made allow the desert region where any kind of aid is impossible. Starting out from the military aeroplane post which was recently established at Bakra on the edge of the desert and in the Algorian region, the party proceeded with the object of making the flight to Tonggourt, a miles of the ones, and thus military station lying in one of the cases, and was done very easily by the whole party. Then the return trip was made without any mendents, clearly showing the value of the scriptsen in making communication over desert country. As the es a number of military posts Fronch army possesses a number of initiary posts in the regions of Algeria and Morocco, the acroplane is certain to be of great value in the future in making a rapid connection

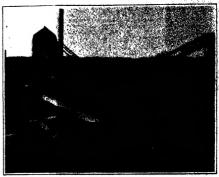
Instruments for Aeropiane Research .-- At the recent Royal Society Soiree, Mr Mervin O'Gorman exhibited numerous instruments used in aeroplane research. Two of these were instruments for measuring the tautness of wires employed in aeroplane and airship construction. The principle of both is and airship construction. The principle of both is the same, one being somewhat larger than the other and reading to higher stresses. In these meters the and reading to higher stresses. In these meters, the wire is passed over three points out of alignment, the middle point being connected by a lever with an indicator. If the stress ou the ware necessary, the middle point to strawn in and the movement is shown on a dial calibrated in pounds or torus. The motor has to be calibrated before actual use on seconation wire, by means of suspended weight aeronautic wire, by means of suspended weights It has been shown by its use during flight that the It has been shown by its use during high that the load that comies on the wires of aeroplane wing framing is often actually twee the dead weight loaded on the wire. The instrument is especially in-tended to show the variation of stresses during flight

The Mackay Army Aviation Cup. -Mr. Clarence II Mackay has presented to the Wm. Department, through the Aero Club of America, a large silver trophy to be competed for by the military airmen of the United States Army in a series of regonnas-sance competitions. The first of these was held at same compenious and on October 29th, 1912, and was won by Second Lacut Henry II Arnold of the Twenty-muth Infantity. No definite date has been set for future competitions. The competitors must fly on the same day if practicable, after hav-ing been notified two weeks before the event. The ing been notified two weeks neduce the event. The tests are to be passed upon by a board of five judges. The highest average rating obtainable will be 300 points, which allows 50 points for each of the six events. The tests include accuracy of location, accuracy in estimating troops, character of written report, time of recomassance, altitude re-quirement and landing accuracy. The height average is put at 1,500 feet. Any competitor dropping below 1,000 feet will be disqualified—this because below 1,000 rect will be disquarined—this obsculate flying at low heights would be suesdail in actual warfaco. Mr. Mackay's cup is of solid silver, thirty inches in height, and stands on a block of Circas-sian walnut. On the rim at the top of the cup are the figures of four women holding in their out-stretched arms four small aeroplanes of the hiplane



Coke ovens with bins and washery, showing enormous development of smoke.

Masontown, Pa.



General view of a retort coke even plant of large dimensions and favorably situated.

## The Beehive and By-product Oven in Coke Production

C OKE is produced by three methods: In the beehive coke oven; in the by-product oven; and as a by-product of gas works. The last being spongy and unsuitable for metallurgical purposes need not be considered any turther.

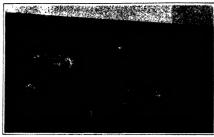
Millions of tons of metallurgical coke are annually consumed in the United States in the manufacture of Irou and steel. This coke must be deuse and firm so as to sustain the superincumbent charge in the furnace without being crushed; it must also be substantially free of subhur

From the simple of the beeblive oven the origin of the name is apparent. In this over, the cold is coked by the burning of the gases evolved and a part of the charge produce also in a simple of the charge produce about airty-flyer tous off cold-distillation inclusive of ter and ammonia having been burned in the coking process. The sames and soot artising from a beshive oven plant create such a missaice that no city would tolerate it in its telicity. While the process is wasteful, it is still able to survive against the competition of the by-product coke oven because of the small capital required for its installation. The coke produced is of excellent quality.

The hy-product over obsit requires the investment of large capital, but its operation is much more economical, moreover, the sancke unbource is absent One handred tons of coal will produce about seventy-five tons of coal, one thousand gallous of sulphate of aumonia, and four handred and fifty thousand cuble feet of limitanting saw. The tar and ammonia operation and interest on the capital invested. It is therefore evident that the days of the beshive over are numbered in dermany, the bective oven was replaced by the by-product over years ago.

The greater part of the Huminating gas of the by-product own goes to waste except where the plants are located within a reasonable distance of large cities which can use the gas. Any returns from the gas are an additional gain to the by-product plant. We may look therefore for a further reduction of the palce of gas in some of the favorable situated cities

some of the favorativi stimuted cities. Bituminous coal is used for cocking, but not all of that kind of coal ts suitable therefor. It is necessary that at the proper stage of coking, the particles should soften and cohere, and form after coaling, a solid mass. Becomity the difficulty of non-coking coals has been overcome. When distilled gason, which consist mostive of hydro-carbons, are passed through no incandescent charge offices, they are 'cracked,' that is, the more complex mole complex mole



Building a bechive coke even.



Interior of condensing house of a retort coke oven plant.



The traveling structure on the right is the quencher, into which the hot

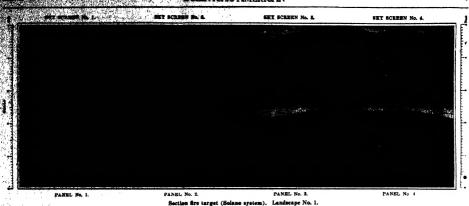
cutes are broken down to form simpler, hydro-carbons. In this breaking down process carbon is split off from the molecules and deposited between the particles of the lucandescent charge. The carbon atoms at the moment of their deposit have the peculiar properly of binding the particles of the charge together; the name "cementitions" carbon has therefore been given to the material thus deposited. At the same time the cote is earthed by this deposit of pure carbon. The silvery gloss of coke is due to this carbon deposit. Where the distilled gases are first passed through gas washers before passing through the incandescent charge, the tar and ammonia may be recovered.

The operation of the coke oven, whether beehive or by-product, is intermittent. After charging the coking chembers with coal, heat is applied to coke the same. Is the beehive oven, as stated above, combustion within the chamber itself furnishes the heat; in the by-product oven heat is applied externally to the retort by the combustion of gash in the besting fuses located in the heating walls between adjacent retorts. When the coking is completed—after 48 to 72 hours—the coke is quenched or couled by spraying water ou it, or in airtight receptacles. This method furnishes a superfor coke

Necestry coke roress have been constructed in which the coking operation is continuous, coal lieing fed into the retort at one sud and quenched coke coming out at the other. The "green" gasee distilled off at the forward end are made to pass through the incandescent charge at the rear end, thus enriching the coke and binding its particles together.

The specific gravity of coke as compared with coal is low. This is due to its porosity caused by the excepting gas during coke ing. But when the coke is compressed yithin the retort, after the volatile matter has been driven off, while it is still plastic and before it becomes incendescent and befure it becomes incendescent and brittle, a very dense coke resembling anthractic is the result. Such anthractic is now produced on a commercial scale.

There are two objections to the use of bituminous coal: One is the smoke nul-sance, the other the poor utilization of the hydro-extrone when burned in the ordinary furnace. When fresh coal is thrown on the fuel bed, volumes of smoke and gases are generated, whose combustion is incomplete. Not only are these gases lost, but their generation absorbe quantities of heat from the fuel bed. Becent methods have produced a smokeless fael by subjecting bituminous coal to a partial coking operation. The coal is heated in rectors at a comparatively low heat, 800 to 1,000 der. Fahr., which expels the beavier, smokely-ordening hydrocarbons, and readers the coal thus treated smokeless. If the work problem is solved and the congettioner's discovering the coal ten and smokeless. If the work problem is solved and the congettioner's discovering the coal ten and smokeless. If the



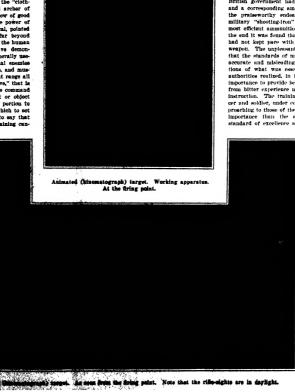
# Teaching Soldiers How to Shoot

How Artificial Landscapes and Moving Pictures are Used

By Major H. Bannerman-Phillips

TiME was when the soldier was instructed to Trearrie his dre until he could see an enemy's features distinctly, when the range at which the coursey of the fireturn of the infantry soldier could be relied upon with anything like reasonable certainty did not encode that of the 'entry park shear,' Truly speed by a trained because of the days of administrative rates and the state of the days of administrative rates and the state, the power definition to be proposed to distinct the proposed to distinct the relief of the days of administrative rate entries the content of the distinct of the proposed to distinct on the desire of the desire of the distinct of the proposed to distinct on the best distinct of the rife. This is not to say that men with good eyesight and sound training cunnoth it the mark at much 1 o ng er distances. The idea is merely that for practical

distances. The creative is the result of the series of the



stendy picked shots on the British side kept a much superior number of Boers lying down in their shelters for three days, so sharp and unerring was their fire.

For half a century before the Rose was the British government had expended much energy and a corresponding amount of public mone, in the prelawority endeavor to evolve the best military "shooting-tron" in the world and the most officient ammunition to nee with it, and in the end it was found that the skill of the soldier had not keep pace with the impresement in his weapon. The unplessant truth was officen home that the standards or military shooting were inaccurate and misleading, based on false conceptions of what was essential to efficiency. The authorities realized, in fact, that it was of less importance to provide better rifes than to evolve from bilter experience more suitable methods of instruction. The training of the holdvidual officer and soldler, under conditions of visibility approaching to those of the buttledeld, was of more importance than the achievement of a high standard of excellence at marks which could be

ly distinguished from their sur-roundings. So far did the average skill of the marksman lag beof efficiency of the really excellent weapon which he carried, that it was estimated that about fifteen hundred rounds of ammuduring the Boer war for every man struck on the enemy's side. Much of this waste of ammunition-in fact, probably three fourths of it-was enracy of aim, but to the misdirected, that is of the battlefield where the enemy was supposed to maining fourth was expended in shots which were true in direction, but fired with the sights of the worns elevation, owing to error in judging the runge. Then again the greater number of holdes which did not find their billier at ranges under 600 yards were probably wasted, because the men tries under conditions which do not obtain in power time, annuely, that the firers were themselves under fire, annuely, that the firers were themselves under fire, annuely, that the firers were themselves where the head down, and frequently because they could see no enough at which to direct their fire, atthough they heard bits missilest strike near them and whis host direction of the strike their directions of the strike their directions of the strike the strike their their directions of the strike their directions of their directions of the strike their directions of their directions of the strike their directions of their directions of their d

Failure to distinguish the target and Jodge the range, difficutities which often go hand in lound, are harder to deal with than want of accuracy of aim at a visible turget, and it is against three difficulties that hondern methods of tostraction in ritle shooting are or should be directed. The purpose of muskery training should is in the first hostnare to make the individual soldier in the first hostnare to make the individual soldier in the first hostnare to make the individual soldier in the first hostnare. His, coversant with the power of the weapon, and confident in his own skill give the tender of the second profile and judgment. He should use the intrader so as to give line best results for his own skill. His leaders and he should alike be capable of should go accurately at a given object, and able to recognize and describe any objective or target against which ritle-fire may require to be directed on service, and to Judge the distance to it from their position at the time. Finally, he should sugget self-control, and cheerbully und he telligently submit to the necessary fire-discipline executions of the cummunder who directs the first, and whose closely is leaders who are capatitived with the inter-tions of the cummunder who directs, and to long-time solves, but in cuncentrair their attention on the objects, and to be attained, select the targets in order of lang-trainer with resurd to hose objects, and direct and control the first of het first instance, and become experts in handling at the inter-time to the standards, to the end that they direct the large of the should be corried.

Besides being able to shoot steadily and accurately when there is ample time to take aim, a mate must be prepared to fire with or without the bayone fixed, at moving objects, and to ret to several shots in rapid succession with undiminished accuracy at cavairy charging, or to repel an attack at close quarters or a result of savages. He must further know how to allow for wind, and how to take advantage of every kind of cover while firing, so as to expose binneft as full time as besides to the view and fire of an enema.

Much of the mechanical partion of the training can take place indoors, on the barries-country and on the rifle rause. Muscle exercises to strengthen the special muscles brought into play, along trigate-proceding (a most important dotail and connected with breathing), firing standing and kneeling, dring proon, firing attituding and kneeling, dring proon, firing attituding and kneeling, dring proon, firing attituding and kneeling, dring proon fring attituding and kneeling, dring proon for each tensity of the standard process of th

Various ingenious devices have been invented to meet the need for visual (raiding away from the rifle range, and the vicinity of the bacracks, without involving the necessity for fedging distance practice and firing over large stretches of country, for which line and opportualty may be brasely wanting.

Among those are the various "lambeaue" targets and the kinematograph or salmated target. The "fluid-seque" targets represent typical stretches of country all the control of the country and the kinematograph or salmated target. The "fluid all the country is a superior to the country and divided lotto panels, some are arranged so that "allhoustie" figures can be some are arranged so that "allhoustie" figures can be moved across them by mechanism worked from the firmoved across them by mechanism worked from the firmoved across on screens show the handwares for firing reactive. In order to avoid the destruction of the particle. In order to avoid the destruction of the particle in the country of the carget is placed at alapsi, "angle," "spur," etc., the target is placed at alapsi when idealines, and described, and the men, festures age political out and described, and the men, festures age political out and described, and the men, festures age political out and described, and the men, festures age political out and described, and the men, festures age political out and described, and the men, festures age political out and described, and the men of the country of

instructor by ginnering along the barrel can see whether they have recognized the target from the description. Field giasses can be used to make out the minor features of the landscape, and to obtain practice in their

The morting pictures of the kinematograph are used to form an animed drarget, infantry appearing and disappearing abelind cover, or moving forward to the notice's cavalry and artilized in motion, appear on a thick white paper screen at which the men under instruction can fire either at discretion or under direction of a leader. Behind the screen a brilliant electric liburiluation shows up each builet-mark as a sharp point of light, but the men fire under normal conditions, in so far that the firing-point is in daylight. A sound goar mechanism, with smally electrical connections, cansees a short stoppage of the picture each time a risk iffed, to enable the hit to be seen, then the builet hole is covered by a access, shutting off the light, and the increal nature increase an interest nature increase an interest can interest again transact an interest again transact an interest again transact as an interest again transact and interest again transact an interest again transact and interest again transacts.

#### Photographing Under Water

In the Scientific American for April 4th, 1108, we justifished an illustrated description of an apparatus decised by (2. Williamson of Norfolk, Va., for carrying on operations under water. The apparatus was designed to take the place of the ordinary diving outfit. Broadly considered, the apparatus consists of three pariets: (1) a fouting vessel of my suitable design; (2) a submerdable terminal operating chamber in which the work is carried on at the hortom of the water, and (3) in collapsible flexible metallic tube connecting the vessel and the terminal operating chamber.

Various types of terminal chambers are used, dependbux upon the class of work to be curried on; but usually the equipment of a terminal chamber consists of tools operated by compressed air or electricity, and mechanical sleeve extensions with aftached mittens, in which a labover may slip his arms and perform his work. The collapsible tube communicates with the atmosphere, so that the labover may perform his work under nonmal atmospheric pressure and therefore much more roovendentity than would be possible if he resorted to the usual diver's costume.

This apparatus was recently used in Hampton Bunds on make the submarine photographs which appear on the front page of this loone. The tube and work chamber were lowered from a thirty-foot barge through a well six feet square in the bottom of the barge. To take the under water pictures a funnel six feet long with a two-foot six-inch glass port at its large outer and was botted to the work chamber. Mr. Williamson's son descended into the work chamber with no ordinary cunera. A frame containing a reflector and a battery of electric lights, sagressating 1,000 candisatively of lectric lights, sagressating 1,000 candisatively and the same around the port. Section after sealment that the same around the port. Section after sealm of the tube was added nuttle the work chamber had reached a depth of thirty feet. Photographs were taken at that depth. The apparatus was then raised to intermediate depths and more exposures made.

Daylight tests were conducted which proved that at depths between ten and fitneen feet photographs of passing she had objects could be made with exposures varying from 1/10 to 1/15 of a second. The water in Hampton Roads is not very clear, but the experiments showed how much could be accomplished in submarine photography, in the clear waters of tropical regions with an asparatus especially designed for the purpose.

#### What Are the Ten Greatest Inventions of Our Time, and Why?

#### A Prize Article Contest Open to All Scientific American Readers

THE November Magazine Number of the SCHETTIFIC AMERICAN Is to be devoted in part to a review of the screen investions of our time. Because a targe number of SCHETTIFIC AMERICAN readers are either inventors or success of hivestions, it seems to the Editors that their judgment of the inventions produced in our time which descrive to be called the greatest, their appurisal of the relative importance of the paramount technical encilevements of our day, would be of peculiar value and interest. Therefore, it has been decided to loave the entire subject to them.

The publishers of the Scientific American offer three prises of \$150, \$100 and \$50, respectively, for the three best articles on the topic, "What Are the Ten Greatest Inventions of Our Time, and Why?"

Contestants for the prize must observe the following

- Each article must discuss and answer the following three questions:
- a. What, in your estimation, are the ten greetest inventions produced within the last twenty-five years. b. What are your reasons for this selection? Justiff your selection in each case.

o. To what person or persons to the greatest credit due in the developing and perfecting of each invention which you have selected?

- the in the developing and personning or sean investment which you have selected?

  2. The entire subject must be powered in a trypwritten article not, exceeding 2,500, worth in length, and must be treated as simply, haddly and sen-sechnically as possible.
- and must no honoline intentions of the intentions of our time, the contestants are limited to mischines, devices and discoveries commercially introduced in the last twenty-five years.
- 4. Since the Schenying American is "the weekly journal of practical information," and its resider perchability of the articles submitted school deal only with patentable inventions and distinct of the patentable inventions and distinct of the patentable inventions.
- covering.

  5. In order to guide the contestant in shedding what is a great plouser lawestion of our thas, it is suggested that practical success and special subgliques to manifold that practical success and special subgliques to manifold be used as a test. A modera discovery may have been suggested long ago and fill undestying theory even worked out mathematically, as in the case of wireless telegraphy, but herectakes it falls which could make the set tolerably, but here there is the discovery manifold under the set tolerably, but here there is the countries of the set tolerably due to make the set of the set
- 6. Contestants must not disclose their identity. Each article must be signed with an assumed name and must be accompanied with a sealed envelope, on which the assumed-name is written, and in which the resi name and address of the author is contained.
  7. Contestants must address their articles, accom-
- 7. Contestants' must address their articles, accompanied by the envelopes containing their real names, to "The Invention Contest Editor of the SCHENTIFIC AMERICAN 361 Broadway New York of The Technology New York of The Technology New York of Technology
- American, 361 Broadway, New York city."

  8. The articles will be passed upon by a Board of Judges, whose names will be announced in a future large of the Screen Advanced in a future
- Source of the Scheritzic America's.

  9. The Board of Judges will receive only the artithes submitted, the survelopes containing the true names
  and addresses of the authors will romain in the possession of the Editors of the Sourchies America's.
  When the judges have made their decision, the Editors
  will open the envelopes of the winning contestants and
  notify them of their success.
- 10. The decision of the judges will be announced in the SCHRITZIO AMERICAN of November 1st. 1918. The prise-whuning articles will be published in the order of merit in consecutive issues of the SCHRITZIO AMERI-CAN, beginning with the issue of November 1st. 1918.
- 11. The Editors of the Schrifted American reserve the right to publish in the Schrifted American or the Scientific American Suprement articles which have not been awarded prizes, but which are deemed worthy of homorable mention.
- of homosome measures.

  12. While contestants are not required to supply pictures with their articles, illustrations will be weitered.

  13. While wavings are submitted, they need not be elaborate; the staff artists of the Schrifter American will work them up for reproduction, provided the material supplied is intelligible. Do not send pictures torn from books and periodicals; they cannot always be reproduced satisfactority, and their unauthorised reproduction may constitute a copyright infragement. If photographs marked "copyright" are sent, they should be accompanied with the copyright were's written permission for their generoduction.

  13. Members of the staff of Munn & Company, In-
- 13. Members of the staff of Munn & Company, Incorporated, publishers of the Scientific American, and of Munn & Company, solicitors of patents, are excluded from the contest.
- All articles will be received up to 5 P. M., September 1st, 1913.

#### To Protect Iron Pipe

I RON pipe can be protected from corresion by heatling in a muffle to 1,000 deg. Fahr. and admitting steam at the same tamperature. A layer of magnetic oxide of iron is formed. A more astisfactory protection, however, is obtained by finishin process. The wellcleaned pipe heated to 700 deg. Fahr. as dipped into a mixture of pitch, coal are and a little impreed oil winish has been heated to 500 deg. Fahr. after a few mixutes the pipe is decided vertically and cooled. Of course the regiod oxidation of the itemped oil, former, at lough hinder, as in paint drying. Lead-deed, pipe in used for many purposes.

## Correspondence

True passers and not responsible for states under in the correspondence column. Anonymous polications caused be complered, but the name prespondence will be solutioned taken so desired.]

#### Schiller's "Bull"

Behiller's "Ball"

To the Religion of the Scrawrayn American:
Your correspondent of March 20th, No. 13; mentions a buil made by Schiller and his translator Coloridge; her of hothers up the German test of Schiller's "Wall-limstein," I getter that the translator alone is responsible to: the mattale. The translation alone is responsible to: the mattale of the schiller's "Wall-limstein," I getter the schiller of th

#### Price Cutting and Trust Control

To the Editor of the Scientific American:
The small dealer cannot afford to out prices; he must sell his goods at a fair profit. The large dealer who outs prices on standard goods for which a demand has been created through national advertising, does not do so to sell these particular goods but to attract trade to his store that he may sell other goods at a

trade to as searlarge profit.

This very thing is favorable to trust control, for by
outting prices the small dealer is gradually frozen
out. There are many other reasons why prices should
be maintained, but to my mind this is the most important.

Banno-Nours Contrant,

D Binnay, President,

G. R. HUSSEY, President

#### Barb Spikes for Rails

To the Editor of the SCIENTIFIC AMBRICAN:
In your issue of June 7th I take interest in your article on "The Screw Spike Versus the Cut Spike." article on "The Screw Spike Versus the Cut spike."

I can readily agree with your argument against the present type of out spike. In one of your lituatrations I notice the position the split wood is forced to take; that is, a downward position from the drive of the spi e into the tie.

Now. If the cut spikes had barbs, such as on a fish hook, would not the swelling of the wood by rain or the like tend to make the wood take a position between se and greatly increase the resistance of the mid spik

Now, with the screw spike as you filustrate, could not a wrench of some sort be put on the head of said spike, and the spike be removed by train wreckers or Of course, without the threaded lining in the tie, this would be a much more difficult task.

In my opinion, I think there is need of consideration and debate along that line. Thomas H. Thomas

#### Fixed Prices and the Public

To the Editor of the SCIENTIFIC AMERICAN:

In the corset trade any manufacturer who can secure a large volume of business can manufacture at much less cost than if he has but a small volume. We know ioss cost than if he has but a small volume. We know of no way of setting large volume that compares with the policy of sequiring a national reputation by ad-writing and by quality for the trade-macked actide, and then fixing the retail price of that article so that all retailers who sell it, whether they be large or small, shall be protected in their profiles. The fact that the American corest manufacture is giving the ultimate consumer better values than any other corset manufacturers in the world, speaks for the soundness of this policy—of establishing a, trade-mark and maintaining

So far as corsets are concerned, there is no qu So far as dorsets are concerned, there is no question but what the cost of living has been reduced by the rigid system of price maintenance that is enforced by all the leading corset manufactures in the. United States. If prices should not be maintained, the large manufactories would become small, and the values that the women who wear corners would get for their money would be considerably less.

(The Wassian Brottman Company.)

Bridgeport, Conn. -LUCIEN T. WARREN, S

#### Baversing the Loos

To the Editor of its Strussyry Assumcas; I have been reading with much interest the fiscussion by the two reasons rathey accommands stop devices in your very validation paper. I find, however, in your district, the Need of an Automobile finite, in James dated June 21st, that a papelle bey received upperform to expressed from relationships the production of patients as expressed from relationships of the two productions.

You infer that the inability to reverse the engine was in part responsible for the collision at stamford on the New York, New Haven, and Hartford Railroad on June 12th. This is erronealthough it is believed quite generally and nginemen themselves who have not learned

by engiasemen themselves who have not learned from experience that to try to stop a locumotive by reversing the engines is utter folly. It is of course obvious that when once the cohesion between rail and drivers is destroyed there can be no further effect of retardation from the 'drivers. When the locomotive is pulling a train at even a slow speed over well sanded rails, if the engines are quickly reversed the inevitable result will be to slip the drivers, and this imme-diately destroys practically all of the cohesion. In she dryamometer are abbind an engine which

In the dynam meter car behind an engine which vas pulling a heavy train I have frequently ob was puling a heavy train I have frequently ob-served the drawbar pull drop practically to zero when the drivers were alipped, the reverse leven not having been touched. I have seen the cohe-sion drop from 40,000 pounds to zero without the position of throttle lever or reverse lever having been changed. If the reverse lever had been thrown over to tweese position and the engines reversed against the momentum of train, the result is obvious.

From current newspaper accounts. and no doubt inaccurate, it can be gathered that the engineer in question did succeed in throwing the eigeneest on question an surceed in arrowing over the reverse lever, which if it be true is merely additional evidence that he was wofully inexperienced. As to providing a more casily operating reversing gear, this has been done for several years on the very heavy locomotives in the form of a pneumatic reverse, which can be operated with less effort than even the throttle, but it is provided for comfort in landling the locumotive, and to advocate it for a safety device is absurd. The final conclusion that "only a stop which would reverse the power could be of any service when airbrakes prove inoperative at the crucial moment." is based on a false premise, and its application would offer no solution to the problem and would, in fact, be not near as fessible a plan as the various types of automatic stop aiready proposed, when airbrakes are operative.

Buffalo, N. Y.

W. L. Heinz. over the reverse lever, which if it be true is merely

Buffalo, N. Y. W. L. Heinz.
[Reference to this letter will be found on our editorial page,-Epiros.]

#### Prices and the Ultimate Consumer

To the Editor of the SCIENTIFIC AMERICAN:

To the Editor of the Scientific America's: I have just finished reading a copy of the Supreme Court's decision in the case of Bauer & Cis and the Bauer Chemical Company v. James O'Donnell. In the writer's opinion we should not criticize the court in its decision. It is in no way responsible for the law, and that is where the main difficulty lies. Therethe law, and that is where the main dimensions. There is a chance for an honest difference of opinion regarding the scope of the word "vending" as incorporated in our patent law. The broad view of this term would our passat is. I us broad view of this corn within lead one to believe that vending of a patented article should be construed to cover the sale of an article or commodity from the manufacture to the ultimate consumer, regardless of the number of so-called middleer, regardie men it passes through.

e courts hold, however, that the vending of the The courts hold, however, that the vanding of the acticle, insofar as the manufacture was concerned, ceased when it passed into the hands of the desler or resulter. The point of differences is that of vending for results and vending for use. Our patent law should be changed so as to clearly cover this point and to bring such a change about. Manufacturers of patent articles handling their commodity through deslers and retailers should bring forcibly to the attention of our legislative hodies the danger to manufacturing concerns if the law is allowed to stand as at present interpreted. Shoukholders and employees of such con-

concerns if the law is allowed to stand as at present interpreted. Bonchholders and employees of such concerns should not overlook the fact that their interests are at stake, and should join with the manufacturers to bring about changes in our patent law to conform to the modern methods of merchandleng. Unfortunately, our logislatures are made up largely of men of little business experience, and their judgment in such matters is based upon theory rather than practice. These men are no doubt prompted by folly mutuve in their attempt to protect the "common people" of our country against the suc-saled monopolies. They unfortunately pick out a few glaring examples of abuse practiced by concerns halft on patent rights, and us these as criterious in their effort to regulate business of this hakers. Their main atm, of course, it to protect these as criterious in their effort to regulate business of this haster. Their main aim, of course, it to protect the weak against the strong; they, however, in strving to accorpilish their od, are weak-ning the strong rather than strengthening the weak; in other words, they are using distinctive instead of constructive methods in their statesprad solution of this problem.

In this case in question, to wit, the taking away from

sufacturer the ability to establish the reprice of his product will work not only great injury to the manufacturer, who has spent large sums of money in bringing before the public the merits of his goods, but will effect in the writer's opinion a result diametrically site to that intended insofar as the small retailer

and ultimate consumer are concerned.

This same point is covered in one section of the proposed Oldfield bill, now pending before the House, which if passed will create a chaotic condition in the business world where commodities are handled through dealers or retailers. When our original patent law we framed, it was not necessary to cover this point in question, as there was little heard of the indelleman in those days, the sales being largely made directly from manufecturer to consumer, and this difficulty manifests steeff in many of our laws in relation to business. Join in other words our laws have not kept dealers or retailers. When our original patent law s to-day; in other words, our laws have not kept pace with the changing methods of doing business. This fact has made it necessary for our courts, in in-terpreting a law as it pertains to present-day business. to read into them words or phrases, thereby adapting them to modern conditions, but in so doing have assumed the roll of lawmakers rather than acting in a judicial capacity as intended. In reading into the Sherman Anti-Trust law the word "reasonable," as applied to raint of trade, illustrates this point.

The writer's contention is the vending of a commodity does not stop with the sale from manufacturer to agent or dealer, but is still in the vending stage until the ultimate consumer takes possession, and, therefore, the manufacturer should have control of the commodity price to the ultimate consumer, regardless of the number of middlemen it passes through Another way of looking at the same point is that

Another way of looking at the same point is time, our patent law to-day gives exclusiveness to the inventor in making, using and selling lus invention. It does not compel him to do any of these, therefore, why should he not have the right to sell his patented article. under any conditions he sees fit? One of these condi-tions being to maintain the re-sale price. The offect of this decision will not only be felt by the manufacturer, of this decision will not only for feet by the manufacturer, who, by the way, through differential discounts and other means at his command, can more or less control the re-sale price of his commodity, but will drive out of business the retail dealer, who cannot stand the price outting which large department stores and mall-order houses could practise in certain lines of goods for the purpose of creating in the minds of the buying public that all of their prices are proportionately low; in other words, using certain well-known lines as leaders and making their profit on lines of goods whose estab

shed selling price is not known.

As to the ultimate consumer, he now has the asthrough the vast amount of publicity gi to standard lines of commodities, that he can put these goods at the same price from a small dealer as from a mail-order house or large department store. Rather than make it prohibitive for the manufacturer who sells his goods through dealers controlling the re-sale price, the small retailer and consumer would be more greatly benefitted by the law compelling manu-facturers and retailers to establish and maintain the same re-sale prices throughout the United States, leaving to their discretion as to what this price should h If they make this price excessive, their goods will not sell; if they make this price too low, they cannot stay in business. This would insure the ultimate consumer being able to buy a standard article at a standard price at any point in the United States, and make it impossible for large corporations to drive the local com-petitors out of business through their ability to out prices in certain localities, while maintaining standard excessive prices in localities where no competition

This very use of price cutting has enabled some of our largest corporations to attain their growth and maintain their monopolistic hold on their commodity, which would have been impossible had they been compelled to maintain a standard price throughout the country. Their shility to change their prices as often as necessity requires should not be withdrawn, provided the price-change effects all localities at the

One point which is apparently lost sight of by our legislators in the present wave of reform to protect the ultimate consumer is the fact that the consumer must produce to be able to consume. Those that promust produce to be able to consume. Those that pro-duce more than they consume are making profit and progress; those that consume more than they produce are on the read to bankruptey. If our law-making bodies would exhibit the same materiat in promoting the production end of our peoples' welfare that they now show in the consumption end, a great many of our business ills of to-day would be remedied and the

bur and little consumers would have the wherewithal to meet the rising cost of hving conditions so prominent in our national life to-day. THE AMERICAN MULTIGRAPH COMPANY, id. Ohio, H. C. Osborn, President. Cleveland, Ohio.

# Some Novel Uses of Compressed Air

## How Compressed Air is Used for Sheep Shearing, Cutting Sugar Cane, and Shifting Automobile Gears

A lit is a harmless, elastic field, non-combustible, and is the most widely distributed of all substances. We simply compress it and hold it in a condition of confinement. We must merely provide a vessel strong enough to overcome its elasticity. With air, when once a vent occurs, the pressure falls very rapidly and the

strain is soon re-

Riveting with Compressed Air.
The hammer dill, used in riveting and and misceilmeons machine slop work, important upplica tions of compressed air. Economy in the use of air is a feat-are of this tool. Small machines use from 25 to 30 cubic feet of free air per minute, the birger 35 to 55 cube feet per minute, and air at a pressure of 80 or 90 pounds - sometimes 100 pounds is generily recommended.
It is expensive to

iny pipe and rivel up the Joints in the ordinary manner. the hot rivets into the pipe, must first be provided; and the rivets have to he pushed up from the inside through the holes, the workmen holding the rivets against the blows Imring all this operation, light rivers are becoming cold, and the difficulty and anwork during the whole task, make it expensive and the results interior to riveting with comressed uh

When using poeuwork. the rivets can the outside, the workman, on the worknmn, on the hiside of the pape, using the look to rivet it up on the inside The worknoon lastde Is thus furnished with good all to breathe handle a light tool

Prematic ham-mers have been a great help to holler makers, in actual test, un operator

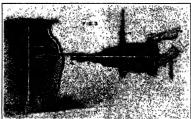
with a paramatic tool cut off a two and a half such tube in thirty-six seconds as against two and a half minutes by hand; and forty six tubes were cut off, turned over and beaded with the same tool in an honr and three quarters as against five hours doing the same work by hand. Horizontal boller seams may be calked and trimmed

one third the time required by hand labor.

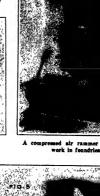
With a posumatic drill holes up to seven eighths luch in diameter can be made, and will drill such indes through a web of a rail one half an inch thick he less than one half a minute. Eighty to one hundred ravets per hour have been driven in field work, creet-ing large water, gas and oil tanks. The length of stroke of the striking platen is issually four inches and about eighteen hundred blows per minute are struck.
Fig. 1 shows such a tool. Air is admitted to the passage c by operating the lever 4 to open the throttle valve 3. When the valve 9 and hammer 13 are in the

position shown, the ports g are open, and permit the air to pass into the cylinder 12 through the port h, to

Eighty to on hundred rivets have been driven in an hour



Cutting the staybolts of locomotive hollers with







mmer until it strikes the tool 14. Just before the hammer reaches its extreme forward postbefore the hammer reaches its extreme forward posi-tion, the grove y opens communication between the ports p and q, whereupon the air passes through n, gaussage o and port p, through q and r to x and x and acts on the vaive 9, driving it to the extreme left. This closes the ports p and A and opens the exhaust port m; and the fluid exhausts to the atmosphere through m. The air now flows through r', k and i and moves the hammer back until us open. This relieves the pres-sure on the valve R, as x is come; and the fir is acx. sure on the valve 9, as v is open; and the air is exhnusted through s, s', r, u, v, sv, w and m\* to the atmosphere. This drives the valve back, due to the pressure also ways acting on the valve, and the operation is repeated.

Ringing a Sell With Ab.
It has been shown that on a local
with a compressed air bell-ringer, that ption of fuel in one month has been en

for the device.

The explanation of the

attached by a bracket to the yoke of the bell; and consists of a stationary portion 8, upon which the cri is introduced at 10. and passes thence ugh the port 11 into the annular ove 14, thence be tween the springpressed plug 22 and the top of the piston. The cylinder is the moved vertically, which causes the disk 18 to operate the crank arm 5 to swing the bell. As soon as the grouve 14 passes the port 11 the air is exhausted and the spring 21 returns the cylinder to its initial position. Shearing Sheep With Compressed

Air. Many attempts have been made to perfect a mechanism to lighten the work for the shearer, prevent the wool from being injured by second cuts and guarantee the fleece to be even in length.

A very satisfac-tory device, operated by compressed air. is shown in Fig. 4. Air enters at c. passes through either port i or i', controlled by the air the respective ends which causes the piston P to be reciprocated, the air being the ports c and p to lever L, forked at one end, to engage with the roller A, mounted on a pin on the piston, to operate the bis

late on its fulcrum / and thus of the shears.

A device of this character reduces the ti-

A certific of this state of seventy sheep by hand to about one hundred per day of ten hours; or in other words, one machine can accomplish in one day as high work one machine can accomplish in one day as high works. as it formerly took three men to turn our are never mutilated, and the wool brings a anriest on account of the length of a

in Fig. 8. This device is u dividing along the center of the







Cutting augar case with compressed air.



A butcher's cleaver that is actuated by compressed air.

In the operation of the cleaver, the works one handle with one hand and another with the other on the vertical portion of a pipe. The flow of air from on the section potential of pipe. The new or a found in facilities supply pipe is controlled by a valve lever. The operation of the hammer may be regulated as desired. The cutter biade is driven through any bones or these with which it may be placed in contact. The workman has only to guide the biade in order to make the desired cut rapidly and effectively.

A Prosmatic Sugar Cane Cutter in cutting sugar cane prior to crushing, it sing, it is e that the came be cut level with or slightly below the level of the ground in order to prevent waste and to even ut the ground in order to prevent water and to consure a good crop the following year. It has been the practice to cut the cane with a case kuife, wished by hand. As the strike are usually from three quar-ters of an inch to two inches thick, the inner is, to say the least, very arduous, since the operator is constantly stooping and must cut the stakes more or less at an whereby considerable waste occurs, as well as loss of time.

and air sugar cane cutter is shown in Fig. 7 The device is strapped to the forearm of the we shown, the latter grasping the handle 29. Air is admitted at 4, below the handle 29, to the 5, 6, and 7 to the port 8, where it enters the chamber 9,

formed by the grooved part 12 of the differ-ential piston 18. From this point the air passes through the port 15, the passage and the port 17 into the chamber 18. The chamber 20 being open to the exhaust 13. The through the port 22, the air acting on the shoulder 23, will force the piston to the right snouncer 23, will force the pancies of the cylinder. As soon as the field 11 uncovers the port 24, the air passes through this port, through the passage 25 and port 26 into the chamber 20, causing the piston to to the left, the exhaust taking place from the chamber 18, through the port 27, passage 21, chamber 28 and outlet 30. This causes a blow to be struck on the tool 39 and the sugar cane stalks to be instantly

In this way the sugar cane can be cut practically as fast as a man can walk, and there is no wasts. The exhaust outlet 30 is so located that the operator, is kept cool. which is of importance, since the plantations

which is of importance, since the plantations are in tropicals climates.
Cutting fider Helds With Compressed Air.
The stary both entirer, operated by compressed to the best of the best is tedition work when Gone by hand. Such a desired is shown in Fig. 3.

When best the compressed by the factible connection at

race us shown at 7-16-7. The tool, is engageded by a flexible connection at-tached to the reproduct Ms, so that the platon red 5 shall be an the prime of the stay, best 17, and the hook 18 of the reasonables but 5 in headed upon the say bolt 20, the reasonables of 18 the headed upon the say bolt 20, the reasonables of 18 the headed upon the say bolt 20, the red platon of 18 the say of 18 the platon is the last the food 18 the say of 18 the platon is the last 18 the 18 the

the tool, 10 th enemy has best 17. The varies a correctly to extend the star and the opining left the pisses so has tability quantities: or the deposition is without feature bears for cell for the star of the star of the star of the star of the cell register of the latter passes and better and the star of the

Compressed Air Rammera.

Compressed air runmers for heavy work in foundries are simple in construction and accompilsh an enormous amount of work. Pig. 2 shows a tool for runming up en sand cores and molds of large surface area and

The tool depicted is suspended by the loop L; but much smaller single cylinder rammers are often used. apable of being carried around by hand.

capable of being carried around by hand. In the present instance, the modd is placed beneath the tool, and air is admitted from the hove V by the valve G, which permits the air to pass alternately to the cylinders A and A'. As the platon C rises, the air is exhausted at D; and when the end of the stroke is ched, the trip I operates the valve G to cut off the air from A, and introduces it in A', causing the pi C' to descend and thus strike a blow with the rammer E, the air being exhausted at D'.

The workman stands in the mold and directs the lows by the handles 8. Oil is sprayed into the cylin-

ders by the olier I and the compressed air

By the use of these machines, one man can readily
do the work of from eight to twelve men. The rammers use air at a pressure of about eighty pounds square inch and strike from two hundred and fift; to three hundred blows per minute.



Shifting the gears of an automobile with compressed air.

The Air Hoist.

The application of air hoists to cranes, planers and, in fact, to all conditions in which a holst may be useful, is now made in an almost endless variety of ways to meet the requirements of machine shop and foundry practice. The hoist is hooked to a tackle for adjusting

practice. The mine is noticed to a further to a distance in the height and the work is quickly done.

In Mag. 6 the valve lever 17, which is usually provided with a chain, is used to operate the three-way valve; 32 to admit, the sile from the pipe 14 to the cylvalves to distinct the six the piston 27. This raises the piston and the loss attacked to the hook 29. When it is marred to fewer the weight, the valve 56 is turned to open the 'core 12 to the unhant and admit airthrough the pine 25, which is connected to the valve casing, at the top of the piston The ports 35 are leak ports to prevent the formation of a vacuum, in case it

is desired to drop the piston by its own weight.

Few realize how cheap it is to operate an air holst. side from its convenience and speed in handling toads It has been estimated that compressed air at 90 pounds pressure costs about five cents per 1,000 cable feet of free air or 143 cable feet of capacity in the air lift; and with air pressure of 75 pounds per square inch a cylinder 5 inches in diameter, a weight of a haif a ton can be lifted or lowered four or five feet.

Combined Pneumatic Gear Shifter and Engine Starter. With the automobile starting crank securely incked away in the tool box along with other implements that seldom are used, it was quite logical to expect that the gear shifting lever too soon would be relegated to ce of comparative obscurity, and it is not the least bit surprising, therefore, that several devices, designed to lighten the burden of the driver by substituting mechanical for manual control of the transmission gears, have appeared of late.

Ever since the beginning of the automobile, comd air has proved a fertile field for the Inventorhistory has it that us long ago as 1800 an Englishman invented and patented a complete compressed nir auto-

mobile; but except for the pneumatic engine starter compressed air devices never have amounted to much up to the present time Now however, there has been developed a new pneumatic system which would seem to hold forth real promise, for the reason that in it complication has been reduced to the minimum. Not only does the system furnish compressed air for inflating tires and for starting the engine, but it also provides means for shifting the transmission gears and the effort required by the driver is no more than is required to advance the spark or to open the throttle. With this system, the operation of shifting gears has been reduced to a simple depression of the clutch

The principal unit in the system is the air compressor, of course—a tiny little four-cyl-inder machine with cylinders measuring two by two that serves also on occasions as the motor to start the gasoline engine. The compressor is geared to the crankshaft of the engine and is quite automatic in action the pressure in the reservoir drops below 200 pounds, a pneamatic valve

matically connects the compressor and re-flits the tank; when the pressure reaches 250 pounds the compressor is disconnected. The valves of the compressor are so arranged that when a lever on the dash is pulled, the unit becomes an aft motor. When run ning as a compressor, the gear ratio with the gasoline engine is 2 to 1, but when operating as a starter the ratio automatically is changed to 1 to 4.

In eliminating the ordinary hand genr shifting lever. the system merely substitutes for it a pision working cylinder, and a selector mechanism operated through a small steering column indicator; the operation of the device is best made plain by reference to Fig. 9. The shifter rods of the gearset are designated

(Concluded on page \$1)

# Fuel Production in the United States

## Present Consumption and Future Supply

By R. H. Byrd

THE United States has become habitually a half bli-lion ton coal country and at the same time a quarfor billion barrel oil country. In 1910 the production of coal for the first time exceeded the 500,000,000 ton mark, and in 1911, according to the official returns of that figure by only I per cent. The increase in the production of coal during the past decade has b

most speciacular. It was thought that la 1980 a high-water mark had certainly been reached with a produc-tion of 200,084,027 short tons, yel the production of the past two years has been mearly double, or 231,412,351 and 220,-504.281 tons greater, respectively. Judging from the most there is no good reason to supin production will not continue; and it will certainly be a year of poor industrial progress where the ontput falls far below the half blilion ton mark Indeed a study of the mine figures for 1911 shows that but for the depre sion in the iron trade in that year, la which coai largely lightes, the coal production would have ord, well in advance of 500,000,000 lons. estimated production for 1912 is about 540,-

In 1911. Pennsylvania as usual led all States in coal production, with a total of 235,185,370 short tons, 144,721,303 tons being bituminous total of 285,185,370 and 90,464,067 tons be-ing anthracite. This is vast production for a single State It is almost as much as the combined production of all the other twentyseven cont-producing States, Pennsylvania has a greater produc-tion than any foreign country except Eng land, and the output of a number of her ladi-vidual counties is greater than that of some countries which are classed as important

The second greatest roducing State was West Virginia, which mined 59.831,580 tons, the third coal State was Illinois with an output

In 1911 of 53,679,118 tons; the fourth was Ohio with 30,759,986 tons; the 1fth was Alabama with 15,021,421 tons—indiana, Kentucky, and Colorado, each produced over 10,000,000 tons

Fully as spectacular as coal is the production of petroleum, which has now attained a highly important position as a fuel and a commodity, and in many locali ties is successfully competing with cont. The follow ing table shows the enormously rapid growth of the petroleum industry since 1900

63 620 520 | 1903 | 100.101.337 | 1903 | 110.701.337 | 1907 | 110.701.337 | 1919 | 209.557.248 1911 ..... 220,449,391

This output for 191f was 63 1/3 per cent of the

total production of the world, despite the fact that the

world's production surpassed all former records.

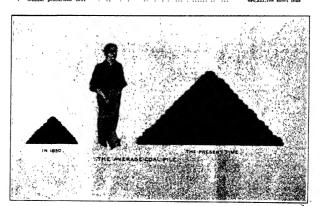
The value of the total production of coal in 1911 was \$625,910,118, of which \$174,952,415 is to be credited to the Pennsylvania anthracite production. price for bituminous coal was one cent lower in 1911 than in 1910-\$1.11 against \$1.12-and that of unthracite was three cents higher—\$1.93 against \$1.90-per reas valued at only \$53,070,515, the figures tically reversed. The average prize of the side West. Virginia coal at the uniness was ton, while that of was valued at only \$53,670,515, the figure ante west virginia com in the state of this of the thin of the much infestor Illinois com! \$1.11 a ton. Some West Virginia con! is shape (thicago. The reason for this is that West Virginia and in a manufacturing State, but that Illinois is or the most im

of her great coal resources, industries on th ir part the producers to get much higher prices than those which the West for their far superior grades of cost which they must ship hundreds and even thousands of miles from the mines. Comparisons beand Alabama are still more striking. In its important iron industry Alabama has a local outlet for most of its eight years the average price has ranged from \$1.19 to \$1.36 a tou. more than 30 per cent better than West Vir-ginia prices. In its high-grade cheaply mined, low-priced fuel, West Virginia offers advantages to the development of manufactures that should place it among the leading manufacturing States. As a matter of fact, it stands twenty-ninth.

With our coal and oil production increasing as it is by leaps and bounds, the question is often discussed: How about the ultimate supply? When will ex-haustion come? I'ndoubtedly the oil supply will go first. The petruleum reservo cannot be closely estimated, like coal deposits; but all estimates place the supply as running up into many billions of barrels so that complete exhaustion of even this fnel is a long way off; but when a few desul-tory facts regarding coal are considered, which may be men-tloned at random, it can

be seen that a genuine "coal pinch" for the American nation is a far distant contingency. For instance, bear ing in mind that the total amount of coal mined and wasted in mining up to the present time is approxi-mately sixteen hillion tons, consider the news item recently given out by the Geological Survey estimating the tonnage of the Bull Mountain coal field in Montana. The tennage of this single, little known, field is pigced at five billion tons. Again, a newly discovered field in New Mexico-the Black Mesa field—is conservatively New Mexico—the Black Mess field—is conservatively estimated, because of meager data, to constall a twelve billion tons. Again, whereis a few years since 60 per cent of the coal in a workable bed wes lost-in getting out the other 60 per cent, to dry the average is represent, and 60 per cent as saved. Another thing, for sometime, the new hundred billion time of Meridia suite install. the five hundred billion tons of Hamite and

Amount of coal mined and unmined in the United States.

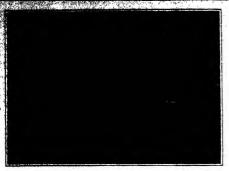


A comparative showing of increase in the consumption of coal (United States).

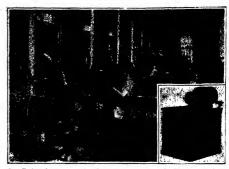
short ton. The total value of the oil output for 1911 was \$134.044.752, an increase of \$6.148.414 over 1910.

The analysis of the prices of both coal and oil in

the various fields affords some interesting study. West Virginia, for instance, which for the last three years has stood second in rank among the coal produc-ing States, the situation is unique in the low price which its excellent coal brings to the producer. The fromble is that the State has no well developed local markets and more than three quarters of her coal is shipped to distant ones, in other States. West Virginia in her remarkable coal deposits has a source of wealth in what it might create in the State were it used to develop home industries. Illinois affords a striking example of what West Virginis might accomplish. Hilnois is the third producing cost state and in former years has had seemed place. In 1911 size

(Conduced on page \$1.) Sas Par A 

An esentior installed in a club house for use in thoroughly sterilizing the atmosphere of crowded rooms.



Installation of an escenter in a large composing room. In the insert an alternating current escenter is shown.

Ozene as an Add to Good Health M gen is the one element which is absolutely essential to the existence of animal inte, but few, however, are aware of one of the most important functions performed by this element, and that is, its purifying properties. Decaying vegetable and animal matter throw off poissonous and offensive genes which tend to make the air dangerous and unified from the control of the control

Practically all organic matter, however, bine with oxygen to form inoffe sive and harmless compounds, chiefly carave an nermises compounds, chiefly car-bon dioxide and water. In nature, this oxidation is generally slow and is inade-quate where the population is congested, as in cities, and recourse must be had to the various chemical disinfectants now on the market, but these are usually objec-tionable. While they destroy the disease s, the disinfectants th the air a disagreeable and offensive odor. Hence, more and more attention is being paid to an allotropic form of oxygen known as osone—a form not only capable of starilizing air and liquids, but of deof origing them as well without leaving a residue. While this gas was discovered many years ago, it did not come into pracuse until in recent years. usually generated by passing a silent dis-charge of electricity of high potential through a current of air. There are, of e, many other methods but they are confined to laboratory use. In nature, it is generated in the air during thunder storms and also by the uitra-violet rays of et rays of sunitght. Its presence can be detected by the peculiar purgent odor in the air espe-cially after thunder storms. Part of this, cially after thunder storms. Part of this, however, is probably due to hydrogen per-oxide which has properties closely auslog-ous to those of osone and which is gener-ated in much the same way.

Ordinary oxygen gas, in made up of molecules which counts of three atoms. All conditions being the same, a quantity of oxygen converted into come would have only two thrifes the volume of the oxygen. Coses is comparatively unstable and readily beenks down into ordinary oxygen. To some is comparatively unstable and readily beenks down into ordinary oxygen. To this possible the great distance in the part of the property of the p

A STATE OF STATE OF STATE



An escenter in position in a trust company's vault.

Osonators are made in a number of different size, for the household, for general purposes, for the factors, and so forth A special small type is also under for use in out-of-the-way piaces, such as basements, kitchens, etc., where appearance is a secondary consideration in houses provided with a furner circulating but air, an increase and the secondary consideration in houses provided with a furner circulating but air, an increase and the secondary consideration in the secondary consideration in the secondary consideration in the provideration, and for ventilating purposes, but for use to various chemical and other processes depending on the use of casion. Officials in liquid form is somewhat the use of casion. Officials in liquid form is somewhat sear with which the valors may come in contact



In this Twombly ozonizer for aterilizing liquids a sterilizing tower is provided with perforated diaphragms.

Adjacent to the inlet of the tower is a spreador which diffuses equally throughout the hotton of the tower the endering liquid and the consisted air. A velocity pipe extends from above the tower. There is also was some supply pipe and injectors between the course supply pipe and the velocity pipe.



The Denaidson ozonizer.

After the six has been washed, chainsed, and wooled, it is charged with occars by a "six gapen." A pipe is connected to the ending of the firm so that a small quantity of the say he blows, by the quantity of the charge the souther. The souther than the southern than the southern the southern the southern than the southern than the southern the southern than the southern the southern than the southern the southern the southern than the southern

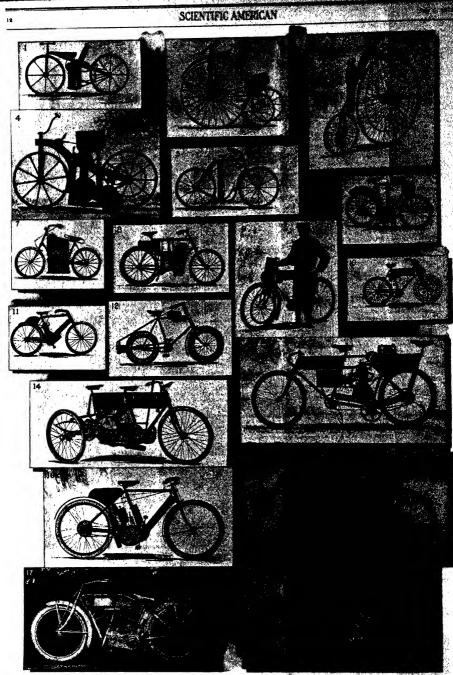
with most substances of animal or vegetable origin and exidizes nearly all the metals, besides producing a variety of other changes, which are not produced by oxygen at ordinary temperatures

Of the many new made of ozone, it is probable that ventilation offers the most probable that offers the most probabling field. In factories however, the probabling field in a factories however, assembly halfs, etc., where rowded consensuably halfs, etc., where rowded consensuably halfs, etc., where rowded consensuably halfs, etc., where he had in the properties of the properties and distincted by using zone. The final and the efficiency of those who must lity and the efficiency of the properties of the properti

It is well known that persons breathing the fout at in erworded rooms and hattings are very prone to contract lung and throat troubles. This could be easily avoided by a judicloss one of ozone. However, there is damped in using too great a percentage of ozone, for it will cause inflammation of the nursons membrane of the respiratory organs. Shore the disinfection theorems of the property of the

The purification of the water supply for cities by the zome process has mot with much success, especially in Europe. In this method it be securited that the water be fully free of solid matter, the less trasitis being obtained when the fluid be first differed. The water and coone are generally thoroughly mixed by means of an injecting neader or the gas is tiplered at the bottom of a tank while the water enters at the top. In this way, the ascending coone becomes thoroughly mixed with the descending liquid. Many tests have been made of water so treated, and in no case have any diaground isacteria been left alive, while discolored and but tasting water is readered clear, sperking and appetitude. A purification process which converts an unwholesome stream into a liquid as inoffensive as the purset spring water is reader that must appeal to all.

In the preparation of ozone, a high voltage in the oxonizer gives the best results. If the gas is made by freating air, the air should be dry, for otherwise considerables should be dry, for otherwise considerables while this substance is an excellent dishinfactant, in treating water it is likely to remain as an objectionable residue. The emain as an objectionable residue. The temperature must also be kept down for at 270 deg. Cent. It decomposes wholly, at 270 deg. Cent. It decomposes wholly impossible to turn all oxygon into ozone.



1 Austin steam velocipeds, 1865 2 "Hightyer," 1876, S. Copeland steam machine, 1885. 6 Datamier's notinguingle, 1885. 7 Reports machine, 1889. 6 Right American motorcycle. 9 and 10. Werser and his pioneyer dicycle, 1888. 11. Handingsar-model. 42. The prediction is supported by the contract of the cont

# The Genealogy of the Motorcycle

From the Steam Velocipede, 1868, to the Standard Machine of 1913

By J. J. O'Connor

g W man wave not observably scoking "the eastest way" not doding platest photocropies still would be things of the Datum. Ellis physical finitizations forever are sour-ring litts du to devise new and less laborious methods of dulgs things. Hartly hat the biterie been onceived,

ring mm one to devise here and less inductors methods of folight things. Earthy had the historic been conceived, there is he for here of the historic head there is essential to its propulsion presented dishelected visions of real work, and nan began to short a pole of mechanical legs that never would first, rependiess of hills and roads, and that would be fair fischer than the common variety of fisch and hone. Hence the inventors' dreams of the motorcycle. As earty, we listed, highlighted, we will also the the thing when the would bely these up hill and against the wind, and in that year, W. W. Austin of Winthrop, Mans, who was cite of the most arient seekers for mechanical preparation, contrived and attached a coal burning steam online to his velocipede. The piston rods were directly own hogs amidships and directly back of the addit. This pistele, which is actually had a very limited steaming attains, in the absence of other convincing proof, galocially accepted as the original embodiment of the activity—the forecame and "daddy" of the now r and "daddy" of the now large and increasing family.

large and increasing family. If anyone stream bispect the fact yet remains undiscovered. The near-set approach to anything of the sort was a "relociped theyeld." This cuttons vehicle was illustrated and facettied in a Buglish newspaper in 1878. The "Slightyre" as it was named, was equipped with two small. typer, as it was named, was equipped with two small; cugfines, "fitted by means of a suitable arrangement" to the interior of the front fork. Over the rear wheele was supported a "little copper hodier and petroleum furnace." It is inferred that the steam was carried from the boiler to the little engines through the fram From the boller to the ittue engines through the yame of the machine and regulated by a turn-cock placed conveniently to the operator. The driving rods com-municated with the cranks on the main axis. As the Situatration shows, the "Rightlyer" had one large driving wheel in front, and two small balance wheels in the rear. The origin and detailed history of the machine, however, are buried in oblivion.

In contradistinction to this rather functful co tion. Austin's steam rejoripede of 1868 is yet carefully tion. Austin's steam reioripede of 1988 is yet carefully preserved, and has been publicly exhibited in the last decade. While the Austin creation was crude and sangainly, and afficted with painfully narrow limita-tions, despite its apparent instability, its builder soitions, owenier to apparent insegninty, in Dminer sol-emply affirmed that he had ridden it the tremendous distance of over 2,000 miles. Whether the extreme proximity of the belier and smokestack to the rider's anatomy seriously diluted his enjoyment of his waird obby, the historian saveth not

a time, and in fact, until the comparatively re ered to be the original American motorcycle was the steam machine devised in 1884 by L. D. and W. E. steam macaine overseed in I.o.s. by D. D. and W. E. Copeland, two California experimenters. The engine and boiler formed a compact and ingenious invention, and inclusive of the driving pulley, weighad but to ounces. This undoubtedly was the first application of ounces. This undountedly we the belt drive to a motorcycle.

ine out unve to a motorcycle.

In a desertation of this machine in a cycling journal of that period a writer said, "The speed of the pulley is seven revenitions a minute. Enough water can be taken into the boiler to last an hour, and the power of the saugne is sufficient to drive the 51-inch biercie or the sangine is sunicisate to arrive the bin-inch network shout 12 miles per hour on the floor, or about one mile is eight untruies on the road; hence it will be seen that it would be quite an asstance to the feet in propelling the resolution. By unsercedar, a couple of hoise the enthe machine. By gine can be rem puts and simple." ved, when there remains a bic

The suggest of this manchine was attached to a lever fifteen distributed keyels, and teadily could be reserved view it. After subdisting the machine throughmaterial to the subdisting the machine throughmaterial fill-fermal, one of the Copseland brothers came east
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builders and a few other enthusiasts of those days. metorcycles were far ahead of the time, and their worth unappreciated.

The only other steam motorcycle of which th authentic record was one made by S. H. Roper of Roxbury, Mass., in 1896. It consisted merely of a standard bicycle of the time, to which Roper attach steam engine of his own invention. It weigh pounds, but despite its weight and awkwardness, the er was able to secure considerable use out of it. and as a matter of course, to be the envy of his fol-low cyclists when head winds and hills were encoun-

taread.

In the meantisms, the gasoline motor was making considerable strides toward its present high state of development, and in the year previous to the appearance of Roper's mechine, 1805, the first public gathlition of mactorceptes in America was held in Madiona Square Garden, New York city. Easily the most senantional machine at the show was that of the Motor Cycle Company of Cleveland, Ohio, the leading spirit of which was E. J. Pennington. Pennington was a foremer, who saw millions in motorcycles, and had little difficulty in corresponding to the control of the control of the control of the correct his belief to the necessarian many others to accept his belief to the persuading many others to accept his belief to the extent of investing in his schemes.

His machine had been put on the road in 1894, and

uch notice was given it in the press, on account of a alleged wonderful capabilities. There was no ban its alleged wonderful capabilities. There was no bean on be introduction of gracinies in the Gardeen in those days, and the Pwanington machines actually were demoustrated in the basement of the famous amphibeater. Two types were exhibited, a motorycle and a motor tandem. Many people took advantage of the opportunity to ride in the front seat of the tandem, and with its four-inch pneumatic tired wheels, it certainly

a gas motor, it was not of the type used to-day, and as a matter of fact, little ever was known of its mechanism, or of the ignition or carbureting apparatus. was attached to an elongation of the right reas stay, and operated on the iocomotive principle with an exposed platon rod. It was claimed that kerosene was used, and that one gallou was sufficient to propel was used, and that the gainor was sundent to proper the machine 200 miles. One of Penington's marked abilities was his reckless handling of facts, and he claimed everything under the sun for his machines. Many people awallowed his claims without a whimper.

mington claimed to control a patent that covered any fluid engine or wheeled vehicle The assertion was made that the engine on this machine could run on any oil, but that kerosene was used because of its greater explosive properties. The failact of this claim is obvious, and the prevarication letar was exposed, with the discovery that gasoline and not kerosene was employed. The frame tube was used to convey the fluid from the reservoir to the motor, which was controlled by pressure of a push button located in the handlebar.

ington's project, staggering in imme put forward at a time when bicycles were on the top wave of popularity, and automobiles were just begin-ning to excite mild curiosity. However, there was no real interest in motorcycles or automobiles at that time, and Pennington's schemes were considered visionary. The motors were prone to overheat on the slightest prevocation, and they proved failures, but served to interest persons who later were directly responsible

dustry.

Seen after the show, Pennington suddenly found urgant business Pequiring his presence abroad, and be left behind many creditors. He later returned, when temposed that his bubble had been forgotten, to engage in sciences new. White American inventors were gage in sciences new. struggling with the motorcycle, it also was receiving persistent attention in several European quarters. Sevpersonnent attention in several nurspent quarrent Several increase affairs were ovired in 1894 and 1895, but the title turned so sixtengly to tricycles that temporarily the two-whosist was lost sight of.

Prominent assising the foreign motorcycles brought out; its the late, planties were the Volta, a French statute. The Computer of the Volta is the contract of the Volta in the Computer of the Volta in the Computer of the Volta in the Computer of the Volta in the Volta

out its the bits, making see the Young motorcycles bringing out its the bits, making sees the Young from the stanger; the Durens, another stam type from the land of Napolesu, but whose designer differed radically from Young in the 184 of hower application; and the passible model of Matrice Worner, which came on the gasuings moose, sanction weren, when came on the scope white we were burning powder with Spain in the West Indice in 1988. The Werner was considered a very practical machine for its time, and a number were built, which performed creditably. The motor was staged in front of the handlebars and transmitted power to the front wheel by belt

To all practical intents and purp of the American motorcycle industry dates from the year 1900, when the first American machine that deserves to be called a motorcycle was produced

The ground once broken, others followed the lead of the pioneer manufacturer, and in a short time a flock of designers scattered about the country amounced their models. Notable among these was Emil Hafel-finger of Hoboken, N. J., who brought out a particularly attractive design that remained standard for several years after, although his machine never was a in the industry.

While there are approximately fifty different brands of motorcycles built in America to-day, built of this number are produced in insignificant quantities ther are produced in magnificant quantities representative makers number about fifteen, thanically the motorcycle of 1913 is a very modern dole, taking the motor car as a standard. The repvehicle, taking the motor car us a standard. entative 1913 motorcycle has twin cylinders, this being the predominant type in the industry. horse-power is standard in power rating, and two speeds are conceded far superior to the single speed

Magneto ignition also is stundard, and chulu deivo again has gained the ascendancy, after a temporary ecipse in favor of the belt. To day the chain predomcupier in involve the sent result from the chain predominates, and there is a tendency to inclose it from dirt. Two types of engine starters have appeared, but the automatic ratchet type operated in foot pressure has proven most popular. The groatest advance of the ent season's models is in increased comfort. is obtained by the use of cradle spring frames and forks, using leaf springs as in automobiles, inclined footboards, providing a natural leg position us in a car, and abolishing the futigue of crumped limbs longer wheelbase and larger tires | Iguition is by waterproof magneto, and lubrication by mechanical Tail pipes and large expansion chambers deade effectually, double brakes assure absolute control, and large tanks afford a wide range of travel on one filling. Although the motorcycle of to-day is considerably cheaper than it was a few years ago, it is the best "buy" the industry ever has offered, and the fact that all prominent makers are swamped with orders indicates that the trade is enjoying the best season in its bistory, with still better prospects in sight for next year. The motorcycle has established itself in the commercial world permanently, and there its greatest future lies.

#### The New First Assistant Commissioner of Patenta

ROBERT T. FRAZIER of Nashville, Tennessee, the commission of Pirat Assistant Commissioner of Patents He is fifty years old, a native of Tennessee, was appointed to the Fulled States Naval Academy and was graduated from that institution in 1883, but was mustered out after a two years cruise with a number of classmates because there were no places in the service for them at that time

He entered the Patcut Office us fourth assistant examiner in September, 1887, and served in the various grades until his resignation in April, 1893, at which time he was a first assistant and about to be promoted to principal examiner. Leaving the Patent Office, he became a member of the firm of Howson & Howson on July 1st, 1901. in April, 1900, he became a member of the firm of Smith & Frazier, which was dissolved in July, 1910. In September, 1910. Mr Frazier re-entered the Patent Office as a fourth assistant examiner, since which time he has passed through the intermediate s and was promoted November, 1912, to the position of first assistant examiner. Like his chief, Mr. Ewing, Mr. Frazier brings to his new position a long experience, including practice within no well as before the Patent Office and in the courts

#### More Permanent Creosoting

THE old problem of retaining the creosofe in treated THE old proper of retaining the timbers seems to be solved in the new plan of applying the creosote with paraffin or stearle acid heated to the melting point. Of course the wood must be hot also. The mixture or solution of liquids penetrates to the heart of the timber, and on cooling the paraffin or stearic acid solidifies, holding the creosote perma-

#### Trucking Inside the Factory

THE cost of transporting material and partly fluished parts from one point to another within a factory is apt to n much higher figure than would imagine particularly where the transportation does not take place over any great distance and it does not pay to employ any special trucking method. In such cases the work has to be done with hand trucks, but even with the hand trucks improvements are possible which will result in conshierable saving. In the accompanying illustration we show a three-wheeled transveyor, the forward wheel of which is swiveled to allow the wheel of which is awiveled to allow the making of abort turns, while the super-structure is so arranged that it may be elevated or depressed with relation to the main frame of the truck. To make possible the transportation of "toto" boxes or platforms, it is merely necessary to provide them with shoes or skids of sufficient height to permit of introducing the transveyor under them. Then the simple action of pailing the handle or the tongue of the transveyor forward from the perpendicular to the horizontal postthe perpendicular to the horizontal post-tion will elevate the box with its load, when it may be wheeled to my other part of the factory. To lower the load it is only necessary to step on a pedal while holding the houlde in a horizontal post-tion, and then let down the platform by raising the haudie until it is perpendicuiar, after which the transveyor may be withdrawn. The elevating mechanism is withdrawn. The elevating mechanism is declarated to multiply the leverage sixteen to twenty times, so that very leavy leads may be elevated. After the loud is elevated the weight serves to lock the mechanism in raised position through the action of togate or knuckle joints. saving the handle free for drawing and steering the truck.

## Towing a Locomotive With an Automobile

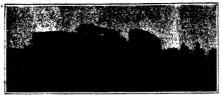
THE average automobillet, who does to the car, would perhaps have a better notion of this life had been a witness of a rather unusual test in Colifornia. A 40 horse-power touring machine weighting 4,000 pounds, was attached, by means of a strong cable, to a 110-tou locomotive. The cable ran from the axis of the car to the cowentcher of the locomotive. The start was made from a dend sandstill. For some time the motor car ground, and vibrated to no swall. The wheels refused to find a purchase and slipped around and around Planilly, half a dozen near were put into the car to do duty as hatlast. This additional weight had the desired effect. With slow reluctance the wheels of the monater in tow long aut to revolve, and the automobile had achieved the seemingly impossible task of drawing so

No injury to the car resulted from this great and unusual strain, and for some distance over the rails the mass of iron obediently tagged after its puny pilot. The demonstration was made by an

The demonstration was made by an automobile agent to show what a really powerful machine the motor car of today is.

#### Automobile That Will Run Suhmerged

WE have seen automobiles running when partly submerged, but it is decidedly unusual to find one that will work when practically overything is submerged except the driver's seat. This is now done in a new French automobile that is intended mathly for use in the colonies, where the car is likely to be required to cross rivers. It will be quite valuable for making trips in these reduces, where the rund is barred to the ordinary automobile by streams which of course have no bridges. The exhaust from the motor is taken off by a pipe which projects well out of water to the rear of the driver's seat. Air for the carbureter is fed through a pipe directly his front of the driver. The only light to the immersion deliver. The only light to the immersion



An auto truck and two traction engines moving a steam shovel.



Handling castings with a three-wheeled transveyor.



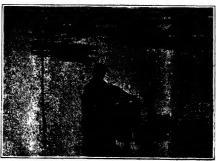
Cone of lodgepole pine entirely buried in the wood.



Section of buil pine showing results of repeated fires.



Towing a 110-ton locomotive with a 2-ton automobile.



An automobile that will run under water.

of the car is to have the divers a collection of water, and in fact it could seen he sight one what deeper than is represented here, provided the driver did not mind being wet.

Moving a Seventy-ten Steam States of Direct Polymers in an odd procession that ye, cently wonded its way across country to Montana. It was forced to move a construction of the control of

#### Peculiarities in the Growth of Trees

THE forester descode very largely on the annual rings of growth not only to determine the age of trees, but also to ossiculate the growth and yield of individuals and forests. Sometimes they serve a different purpose. A few years ago, in a lawsuit involving a forfeit of \$25,000 as unrely against the cutting of timber on alleged Tennessee State land, sections of trees trunks taken near the ground were admitted as evidence in locating an old stream bed which marked the boundary of the uricinal grant. This was made possible through the fact that the timber on the newer land was younger than that our the original banks of the stream and was also even-aged instead of all ages, thus showing that the change in the bed of the stream had been made rather suddenly and comparatively recently.

The occurrence of a severe fire, an insect infestation, an unseasonable frost, or periods of abundant rain or of drought may be read from the effects produced upon the structure of the wood from year to year. If a fire is severe enough to destroy portions of the cambium or growing layer of a tree the wound will event ually grow over from the edges. Even if entirely effaced from the outside it will appear upon cutting open the tree, and if the number of rings is counted from the very edge of the would to the bark the time of the fire can be determined with accuracy. The section shown in the iliustration is of a western reliow pine repeatre-scarred, but uble in each case to survive the injury.

The tendency of a tree to cover up an object attacked to it is commonly observed in the growing over of naths and wires. In the accompanying photograph is shown a pine cone naturally buried in the heart of the tree on which it grew. The cones of lodgepole pine are small and usually persist on the tree for many years without opening. In this case a cone remained so long that it was caught by the growing wood and completely enveloped.

#### European Dress in China

A CORDING to the American consultant Swarow, shortly after the revisition of 1911-12 there was a merical condition of 1911-12 there was a merical conditions of 1911-12 there was a merical condition of Chinese to adopt Darropean dress. Although the bulk of the people contil not afford to follow this feathon; there was for a time great demand for all more afford for a time great demand for all more worse, a reaction has set in, and it is said that of those win a dopping foreign stress last year perhaps on per centificative more back to native vicinities, 1981s, grays declining in typice about it great-majo, the lately rhose lately respectively.

The first of the state of the

# Inventions New and Interesting

Simple Patent Law; Patent Office News; Notes on Trademarks

#### a Ewing, Jr., the New Commissioner of Patents

A FTER an efficient administration of aix years Edward B. Moore retires Patent Office and makes place for Mr. Thomas Ewing, Jr.

The patent bar as well as inventors in general have reason to be pleased with Mr. Ewing's appointment; for like his predecesses, Moore, Allen, and Duell, he served for a time on the Patent Office staff. He is therefore thoroughly familiar with the ways of the Office. On October 22nd, 1888, he cutered the Patent Office as an assistant examiner after having passed the usual Civil Service examina-tion. He resigned on October 9th, 1890, having meanwhile been promoted

After leaving the Putent Office Mr. Ewing engaged in the practice of law in New York as a member of the firm of Ewing & Ewing. As might be expected, he has made a spec thus supplementing his fundamental Patent Office experience with actual active practice, both in soliciting and in con-tested work before the Patent Office and the courts. Mr. Ewing is therefore an incumbent who knows from experience both sides of Patent Office procedure.

Although a specialist in patent law, Mr. Ewing is also a business man; for he is president of the Current Literature Publishing Company. He has always taken an active interest in municipal affairs and economic conditions and was Democratic candidate for mayor of Youkers in 1897

It will interest manufacturers and inbefore the Cougressional Committee on Patents last year and strongly disapproved of the Oldfield Bill on that occa-

# A Controlled-key Adding and Calculating Machine

MODEL of an adding and calculating A machine just put upon the market contains several radical improvements which are said to be revolutionary in their effect on correctness of operation. effect on correctness of operation. The object of these improvements is to elim-inate to the last possible degree the hu-man element of error and thus guard against the mistakes of mis-operations due to the inexperience of beginners or the carelessuess of experienced operators. This controlled-key machine compels curintroduced to accomplish this astonishing result are: Interference guards at the sides of key-tops to prevent accidental on of a key adjacent to the one being operated; automatic locking of all other columns when any key is not given its full down stroke; an automatic block against starting any key down again until the mistake is corrected by completing the ne up-stroke is completed.

The significance of the first of these

automatic features is quite apparent. It is obvious that in a duplex machine, here two or more keys in different cola key standing next to the one in-tended to be touched may be accidentally depressed far enough to cause the unin-tentional adding of a number lu another degreesed far enough to cause the unin-tentional adding of a number in another column. This cannot happen in the new machine, because the key is made in two parts, so as to prevent its depression ex-

ept when struck squarely on top.
The second and third automatic added afaguards inche the machine practically satignardi inshe the machine practically proof against he faults of the operator. In order, to perform their proper function and correctly and their respective numeric states, the large must of course, be stren-tically full assembled travel or hoth the dequivered and return afrees. Others

touch is quickly acquired and soon be comes a fixed habit with the experienced operator, who is able to work at high out the aid of the controlled-key. The beginner, however, tempted by the rapid action of the machine, may try to go too antitude of the maximum, may try to go too fast at the start and by a slurred or par-tial key stroke, make it add a wrong amount. With the controlled-key feature such errors, whether due to carelessness or inexperience, are impossible. If a key is not given its full downward stroke, the keys in all the other columns are immedi-

ience to those sheent from their office or homes when others call them by phone e experiments were made in co with a number of subscribers of a Paris exchange whose telephone instruments were fitted with a special magneto. On turning a handle of this magneto a lamp would be automatically lighted at the desk of a special employee, who on receiving such signal outs off the connection with the subscriber's number and receives the salls for such number and notes down such communications as persons calling up such subscriber in his absence desire to give him. On the subscriber's return to the actely locked and the numeral wheel in the column where the error is made shows office another turn of the magneto handle

Thomas Ewing, Jr., the new Commissioner of Patents.

a figure at the sight opening, standing notifies the special operator that the sub-out of alignment in a direction nearer to sorber on receive further calls and all the operator. He can tell which key was communications received during his ab-mis-operated in that column by looking at some can be transmitted to him. It is the figure of the last time added in that joined that the system is technically a

In case of mis-operation on addition, if any num bers have already been add unfinished stroke of the partially de-pressed key. A release button which stands close to the 9 key is then deprand the operator proc is with the addi

'If the operator attempts to start a key down again before letting it clear up on the return stroke, his effort to do so is instantly blocked by an automatic lock of the upward movement until it has been ompleted.

These improvements comprise what is in effect an automatic block system against mis-operation, which not pair notifies the operator of his facit, but com-

A French Telephone Experiment SOME French government enginees have broadly been experimenting with tele-phone systems seeking to avoid incon-

scriber can receive further calls and all

#### What Seems a Bad Practice

THE writer a short while ago, waiting for the elevator in the Patent Office building at Washington, overheard a conversation between two young practition apparently, but unknown to him, which indicated what seems to be a very improper practice. One said to the other: "He has number of applications in the Office and a number of applications in the Office and I don't know what they cover, but I think! I will slip in an application and find out." His purpose was evidently to file an application for patent for the purpose an approaction for patent for the purpose of ascertaining the subject-matter of some application or applications which had been filed by an another applicant in good faith. In thinking how this could be done ratts. In Emning how this could be done without actual perjury it cocurs to the mind that one might pursuase a device on "the market upon which application for patent had been filed and make some addition to it and file an application to it and file an application to patent outside the property of the

addition. In some, if not many, of the divisions of the Patent Office claims would be suggested, for purposes of interference with a previous application for the original invention and the second applicant could insert such claims if he desired an interwith a previous application for the original invention and the second cant could insert such claims if he estred an interference even without the formality of a supplemental cath. Or if he did not desire an interference, as he would not in the case above supposed, he would have obtained information from the Patent Office that an application for patent vas pending and contained claims, the uggested ones, which were deemed by the Patent Office to be patentable. The reprehensible practice above outlined should be avoided or blocked either by a stricter observance of rules in force, or by the institution of other rules which would effectually prevent the practice.

#### Home-made Lawn Rollers

MUCH ingenuity and considerable invention is displayed in the production of lawn rollers for domestic use. These are sometimes made of cement and frequently with the aid of terra cotta or metal pipe of untable length open at both ends and in which the cement is poured, form-ing a solid roller. Recently the writer ing a solid roller. saw a home-made roller in which the trunnions for the handle projected beyond the cement and these trunnions were at the coment and had its central portion flattened and perforated by bolt holes through which olts passed to secure a number of short engths of scantling which were used as folling blocks to reduce the amount of soment and thus lessen the weight of the roller. When terra cotta pipe is used, it can, when cracked, he entirely removed from the roller leaving the coment roller An ordinary lawn mower handl with arms of wrought iron which can be made by any blacksmith, supplies a suit-able handle for the roller and the entire ost is said to be very much less than the ordinary commercial roller.

#### Some Early Patent Office History

DOCTOR THORNTON, the first Superntendent of the Patent Office and who was appointed in 1803 by Jefferson to issue patents, continued in such office until 1827, a poriod of 24 years, his ad-ministration of the Patent Office being, it is believed, much longer than that of any of his successors. William Elliott, one of his associates who left the Patent Office communications received during his an-name and the transmitted to him. It is in May, 1829, in writing a letter dated claimed that the system is technically a January 16th, 1830, to John D. Craig, success and the question of extending it to all subscribers is being considered.

Office, said of Dr. Thornton, "he con-Office, said of Dr. Thornton, "he coneised freely much discretionary po exercised freely much discretionary power in the issuing of patents; for he held it as a maxim, and I believe a very good one, that the patent law was made solely for the 'encouragement of authors and inventors' and not to collect revenue." It is refreshing to find that such a spirit was entertained so early in the history of the United States Patent Office.

> Another Magazine Tobacco Pine .-- A patent, No. 1,058,232, for a tobacco pipe, the invention of Selim W. Gunn of Feeding Hills, Mass., shows in a tobacco pipe a ster which has the usual smoke passage which communicates with the bowl midway between the top and bottom and a magazine is arranged under the stem and communi-cates with the bottom of the bowl through an opening controlled by a shield, a plunger operating in the magazine to force the tobacon therefrom into the bottom of the

#### RECENTLY PATENTED INVENTIONS

These columns are open to all patentees. The notices are inserted by special arrangement with the inventors. Terms on application to the Advertising Department of the SCIENTIFIC

#### Pertaining to Apparel.

Pertaining to Apparel.

COLAR RIPTON.—W. COCKNOWP, 185 Bo.
4th N Itrocklyn, N. T. This invention has particular reference to a fastener for mean draw collers. The special object is to provide a button whereby it is possible to obtain a clear fitting collar, especially of the type having an articulant lock, without solling or breaking the collar.

ing the coller COLAR FOR SHIRTS.—B SUNMINE, 505 Laberts Ave., Wrocklyn, N. Y. This invention relates to wearing appared and provides a soft coller for shirts, arranged to permit wearing the coller in termed-down fashion or in high doubled ap style to sulf the convenience and comfort of the weater

#### Pertaining to Aviation

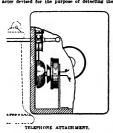
APERDIANN,—O., JOHNNO,—E. Richmond, Va The safety means of this device consist of a series of pivoted wings which may be so unanipulated as to provide resisting surface in tene of suded mesons forward or beckward. The wings also serve for restoring the device to normal position where it is tipped and may, therefore, be used itself to the ordinary also only with provided the provided of the provided that t

Ministry of the Control of the Contr

deck of the vessel.

TRLEPHONE ATTACHMENT,—A, RCHLOR

ARE, Dodge, Neb. This invention pertains to
improvements in telephone attachments, and
has particular reference to device of this character devised for the purpose of detecting the



interference with party lines due to unauthor-ised parties listening to a converantion. An object of the improvement is to provide a detector of the nature indicated which will be simpler and more effective than those berete-fore ordinarily proposed.

#### Of Interest to Farmers

Of Interest to Farmers.
BILE GRASS SEED HANTSTEEL—8, E
MCCORRE, McCornick Rive, Wincheste, Xy
An object of the invention is to provide a devire by means of which blue grass used may
seek for other receptacles at a maximum
rate and with very small loss of seed.
VINITILATOR FOR BROUDER HOUSER.—
C. W. BRICK, Crossvicks, N. J. This invention
reters particularly to a means for resultiating
brouder houses, and provides an improved form
of vacilitate and in connection theretin.



VENTILATOR FOR BROODFR HOUSES.

means for heating the air inducted by the vantilator; and to provide a safety valve ex teriority of the brooder house, whereby to pre-vent the delivery of 100 strong a current of air thereto.

MOTOR PLOW.—F. S. HOUBER, Cuba, Kan This invention relates especially so motor oper-ated plows. Among the objects of the inventor is to construct a mover ploy whose frame is of movel construction whosely the implement is adapted for better, gender and news consul-

1

eal service than is common in this ci-

machiney.

WHEAT CLEANER—J. J. RAMAUR, care of R. S. Coster, Lincolaton, N. C. This in vection has reference to machinery for winning or cleaning grain in mile or clerators and has particular reference of a machine of this type indicated for the thorough cleaning of wheat preparatory to the manufacture of the highest grades of flour in a flour mill.

Of General Interest.

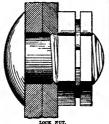
GASOIANE SEPARATOR.—C. S. Wasse,
Continenta Are. Believilis, N. J. In this
case the separation is gravitational, and the
scale the separation is gravitational.

MOLD FOR ELECTROTTPINO PROC.
SENER.—A J. TAILEY, care of B F Calevolt
in this instance the invention has reference
to moids for use in electrotyping processes using a cyanide bath and more particularly it is
directed to a new and improved mole whole
invented to a new and improved mole whole
invented to a new and improved mode whole
servation.

STRAP LOOP.—In Sanusa, G2I Broadway,
New York, N Y This invention relates to
metallie loope for various strays, including
bein, but has more particularly for its design
us stiggs sepondally of army rifles, where a
closed loop cannot be passed onto the siling
from an end theorof, owing to the other fittings of the sling.

#### Hardware and Tools.

LOCK NUT -1. D. ETTERMAN, 8518 Moni-gall Are, Kansas City, Mo. The invention per-tains to lock nuts to be need with the ordi-nary ants of boits in railway joints, and in other situations where nuts are subjected to vibration. It relates particularly to conceve



nnts. The inventor provides a nut having a concave side in which the threads will be from mutilation at the concave side and that readily engage a boil. Gripping means provide for engaring the opposed face of the ordinary nut with increased effectiveness.

#### Heating and Lighting

Heating and Lighting.

GAS FURNACK.—E II. Thorran, ear of Driver's Union Nock Yards, Caimboa, Ohio Tree investor Nock Yards, Caimboa, Chio The investor relates to a form of gas furnace to the control of the properties of the control of the properties of the proportion to the fire some Heated art is rapidly and economically carried away from the farance through the heat-carrying pipes, in this furnace the fame is in direct constant.

LRNS SUPPORT.—W. T. FRIEN, C. E. JONES, and F. T. Friend, care of F. T. Fried, C. E. JONES, and F. T. Friend, care of F. T. Friedd, P. O. Box 1246, Saaford, Fis. The purpose-term is to provide an improved less support for use on ismips and arranaced to permit of residitive to the source of tight with a view to concentrate and direct the rays of light to a desired point or object for rending OIL BURNER.—B. H. ECKLIARIT, York-town, 7rs. In the present pirect the size of the control of the control

#### Household Utilities.

Moneshold Utilities.
BATH ACCESSORY—F. HS.M., 511 5th
Are, Kalispell, Mont This invention provides
a frame for holding a wash cicle or similar
device wherein the cich or device is guickly
and readily adjusted to the frame; provides
means for mounting the frame in service position upon a both tub; and provides a frame
having a convex surface

LACE CURVENT IN ANNUEL \_\_\_\_\_\_ A MONEY.

having a conver surface
LAGE CINTAIN HANGER.—J. G. HOURES,
Newark, Ohlo The brackets are made so ge to
make them castly applied to the framework
regardless of the width of the frame so that
the brackets may be securely held by the direct
curtain supporting element, provision being
made for the removal of the brackets without

work.

BED BOTTOM,—J. H. Finnen, car
Charles P. Plehert, 223 St. Paul St., Raitie
Md. The invention relates to bed bottoms
vided with a flexible member of wire, rop
cable which is normally maintained under sintained under ten



parts. More particularly stated, in a bed bottom a single cable is sriended back and forth tengthwise or crosswise of the bottom and the tendon of the cable is there distributed and equalised automatically. The bed bottom is provided with improved mechanism for varying at will the tanshon of the cable.

#### Machines and Mech

Machines and Mechanical Bevices.
CLOTH LATING MACHINE—M. Issac,
care of the Shattle Co., 18 R. 17th St., Manhattan, N. Y., N. Y. This invention is designed to take cloth, such as wooken cloth
that is folded in half, back as wooken cloth
that is folded in half, back of the county
of the parpose of cetting it into pieces, to make
parts of clothing. The machine is made to
take pieces of anch cloth which are ofther in
a roll or in folds.

late pieces of since costs which are either in CASH BROISTRE WITH A SINGLE, SATT OF KETS.—R. T. PERCICILLI, VIA PIETRIPAIR N. 46, Pierrose, Italy. This invention refer-to improvements in that class of cush regis-rent provided by the cost of the cost of the provided by the cost of the cost of the amount of Signers can be summed up, for the arrangement is such that the bay which is the mechanism for registrate the higher units of the number; the key which is pressed down secondly puts take models. The cost of the best of the cost of the cost of the cost of the best of the cost of the cost of the cost of the best of the cost of the cost of the cost of the best of the cost of the cost of the cost of the best of the cost of the cost of the cost of the best of the cost of the cost of the cost of the cost of the best of the cost of the best of the cost of the cos

Prime Movers and Their Accessories.
VALVE—E. Bismor, 401 N 7th Avs.
Jamestown, N. D The improvement relates
particularly to valves intended to be located
in steam pipes to shut off and regulate the
supply of steam flowing therethrough to a



CONDUIT VALVE.

point where the same is made to do its work; and it comprises a construction wherein the vaire head while being moved by the etsm, at the same time has a movement independently thereof, and wherein the etem is protected against action of the etem is protected against action of the etem at guard against wear and corrosion.

war and corrosion.

METHOD OF MAKING HOLLOW PISTONN.—H. H. Paracts, 50 Sandwell road,
Handsworth, Birmingham, Bigniand This intraction relates to pistons supplyed more sepe-cially in internal combustion engines for motor road vehicles and the life, and the object is
to construct a piston which reduces the
lactite effects and west experienced with ordinary bistons, is cheaper to construct and is
capable of being very convaniently case-hardroad.

Mailways and Their Accessories.
RAIL JOIN,—J. F Fonsy: Ribonington,
Ind This invention periode a joint which
will have the same officient and safety under
which will have the same officient and safety under
which increase.

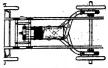
The competitive, and which
will increase the competitive, and which
will increase the competitive produced plates preyield with filters, having a higher conflicten
of friction with the rail than the plates and
having a key in one of said plates engaging
the wobs of the rails.

GAME APPARATUS IL. GROWNELL care of State Easts of Resistin. Seattle, Waste. The object of the invention is to provide a new and improved game apparatus arranged to

COUNTRY SEATE—N. Smeets, 198 of walf fit. The Links, 198 of walf fit. The Links, 198 of the links of the link

Pertaining to Volkides,

FLUID TRANSHISSION FOR MONTH WISHICLES.—E B. VARGERS and F. Z. Exastros,
036 R. 12816 St. Cleveland, Ohlo. Ex this
patent the object of the invention is as improvenest in the construction of molar vahicles in which a circulation, regald is subset-



PLUID TRANSMISSION. FOR MOTOR VEHI

Designa,
DESIGN FOR CARPET OR RUG.—W. B.
SATERA, care of G. B. Equire, 25 Madison
Ave, New York, N. Y. In this orsamental
design, No. 44,032, for carpet or rag, the
border arranged in several bands and the Seld
several bands and the Seld
exquisite forms. Mr. Sayars has also designed
another carpet or rug. No. 44,053, whereout the
border comprises marrow bands of misute figures surrounding one of Sowers. The field is
ribotrarity designed with serolis, visual and
following the comprises the comprise of the comprises of the comprise of the comprises of the comprises of the comprise of the comprises of the comprise o

DESIGN FOR CARPET OR BUG.—J. G. PRORI, care of G. B. Squire, 25 Madison Ave., New York, N. Y. In this ornemental design, No. 44,023, for carpet or rug inside of a bor-der lies a farm acone comprising trees, house, pasture, a girl and five sheep.

pasture, a girl and five sheep.

DEBIGN FOR A MACHINE STAND.—M.

TAIGMAN, 239 Wooster St., New York, N. Y.

In this ornamental design for a machine, the
frame, comprising uprights, connecting pieces
and base is delineated in graceful, yet simple
lines.

Norn.—Copies, of any of these passests will be furnished by the Supergrow American for tan cents each. Please state the name of the patentes, title of the invention, and date of this paper.

This paper.

We wish to call attention to the fact that we are in a position to render compensate survivous in every branch of patent or timeders work. Our staff is composed at mechanical, which is the composed at mechanical trained to prepare and expert, theretogaily trained to prepare and expert, theretogaily trained to prepare and expert, theretogaily extended to prepare and experience of the complete matter application, irrespective of the complete matter involves, or of the subject matter involves, or of the subject to the complete the experience of the e

We also have associated throughout world, who sasies in the presentation of passes and trade-mark applications filled in all as tries foreign to the United Spinites.

dranck Office. 636 P Street, M. W., Wicklington, S. ct.

and the second s

Grating Stockel Flield During Rein, scale, Nos. 1993, 189 and 1,093, 189. Owner L. Hedges and Arbur M. Franch C. Gelst, Mr., provide for cover which is extended to incente hashed field all as for books and masts for suppor-tion severe and adjusting them in un-ternative and adjusting them in un-

wen measure, over the field to be protected.

A field insisting There Pot.—William A. arthur in the property of the connection, with a water sweer job in connection, with a water meghade coveraged above it and having medicals leading down to the pot with a sire by which the flow of the water may registered.

A Thomas A. Balson Reproducer.— homas A. Edison, assignor to Thomas A. dison, inexposated, has secured patent is a reproducer for talking machines in talch is provided a disphragm composed a municum of machines. the he provided a dispirage composed a number of superposed sheets of Japaspaper inited unto a unitary structure, a saper inited unto a unitary structure, seastly yielding member is located contrically with one of the faces of the destroomy with one of the faces of the disphragin and extends into proximity to the periphery thereof, and the said elastic member decreases in thickness from the senser to the periphery. The patent is No. 1.068.021

A Return Savelege Long Retained.—As indicating the persistence of advertising and the tensoity with which some people retain a paper or an address, it is noted that the Washington office of Munn & Co. halfy received a return addressed en-age, with the printed address of such se at the somer of 7th and F Streets, while the office was moved from such loca-tion on the last day of the year 1865 more

A Confidential Telephone Transmitter.—
Maximilian Well of New York city, in patent, No. 1,088,120, 360ws a telephone transmitter in which there is combined with the disphragm a speaking ohamber which is adapted to receive and prevent the escape of a sound wave of speech, such chamber being formed with vacuum jacketed walls and with a mouth piece conor approximately to the mouth of the

Computing Scale with Automatic Cuteff.—A San Francisco inventor, sonn s. Duffle, has secured a patent, No. 1,057,811, for a simputing scale. It has a hopper normally closed and a latch adapted to hold the gate open with an electro which, when energized, will open the latch. whish, when energized, will open the latch. The computation chart of the scale has a hand which can be placed at the desired opint on the chart. Another hand, open-sted by the weighing apparatus with ele-urical whostly, energized the magnest when the two hands are brought together to close the color.

the sizemit States to at Enventer.....Robert Fulton has a estone in the hall of Parie, Statuary Hall of the States to the state of the States to the Hall of the States Challed States Chapted a Wandlagton. Inventees who viet the building will doublest be interested in this imposing work, which represents Fulton seated with a model of a steambeaute in this hand. The chapte was encouled in 1894 by Howard Robbart and whe purchased by the State of Pennsylvania at a coint of \$7.000. It was allowed by the States in Statespare.

shifting eministed from this bureau. The bureau would regret sky ortholom that weight injure the business of any firm mak-ring efficient machine, but it must be noted that the maker of an efficient machine would undoubtedly selse the advantage coffeed by publicity by proving by demo-stration that his device is effective. No sersion that his device is execute. No prolonged test is necessary in such a case, and the proof or disproof can be seen by a glance at the peeled potato. No criticism can thus injure an efficient machine."

Wanted: Machinery for Leves Building Wasted: Machinery for Leves Bulking.— —16 is pointed out in the Baginsering News that "The leves along the lower Mis-stastpp River from Caire to the Guit con-tain nearly 250,000,000 emble yards of earth, a greater volume than the total excevation on the construction of the Panama Canal. Practically all this work on the Missteippi leves has been done by either hand-cower or hones-power. The on the Mississippi leves has been done by either hand-power or hone-power. The negro pushing a wheelbarrow and a team of mules pulling a drag scraper proposent the motive power and tools by which almost all this enormous volume of earth has been moved. At the present time the probability seems strong that a great addition will be made to the Mississippi leves and the contract of the description of the contract during the next four or five years. The floods of 1912 and 1913, following in such oloss succession, have aroused the people of the valley to the realization that the present leves system, while it has for a long term of years, from 1897 to 1912, kept practically all the flood waters off the lands of the data, is not secure enough and high enough to guard the years of exceptional flood. It is probable, therefore, that dur-ling the next five years many millions of outlie yards of earth will be added to the Missistippi leves line, and there seems to be an opportunity here for the manufac-turers who have developed new forms of excavating apparatus and earth-handling mackinery and for the contractors familiar with the use of such mackines to prove the value of those devices."

The Unique Organization of the Patent Office.—The Patent Office, as at present constituted, presents a condition of affairs believed to be unrivaled in any civil de-partment of the Government. We have partment of the Government. We have here one of the most important bureaus ever instituted by the Government. In it the head, his two assistants, the chief clerk all the law clerks, the board of examiners the had, his two assistants, the chief clerk, all the law clerk, the board of examineration-hised and the chief of the cleanification division, the entire ranking official force of the office, are men who entered the office at the lowest grade of the examining corps and have passed through the intermodiate grades to their present positions. There is not recalled a previous administration of the Patent Office in which the Commissioner attered through the several grade is not proceed through the several grade is continuous service until he had reached the position of Commissioner. This is true of his two assistants as well and of the other officials appended above. No other efficials appended above. No other efficials appended above. No other officials appended and the control of the control 1907 when he was appoint he President Rossevelt.

A Ges-engine Starter.—Russel J. Mac-Larin of Grand Rapids, Mish, assignor to N, Jay MacLaren of sums place, has a pei-cus, No. 1,088,947, for an impine startes in which a test containing fixed gas under pressure in countries of the containing the countries. whiteness (D. C., union which a seak containing fixed gas under pressure is contained with the Intake manifest and pressure is to the manifeld and mease six and pressure in the Intake manifest and pressure in the Intake manifest and pressure in the Intake manifest and Intake in I

## CARBON DEPOSIT—How to reduce it

Considerable nonsense is current about carbon deposit.

Any product that will burn must be largely carbonaceous.

Lubricating oil will burn and is therefore plainly carbonaceous. Non-carbon oils cannot exist.

But the amount of carbon deposited depends on the carburetion and gasoline combustion, and on the character of the gasoline, as well as on the lubricating oil itself and its fitness for the car.

The presence or absence of carbon deposit in no way determines the lubricating efficiency of the oil.



Under identical conditions. however, some lubricating oils will give much more carbon deposit than others. This is due, in part, to three conditions:

(1) The crude oil from which the lubricant was manufactured may have been unsuited to gas engine pur-

(2) The oil may have been im-properly manufactured or filtered.

(3) Its "body" may permit it to work too freely past the piston rings into the combustion chambers.

To reduce carbon deposit, it is absolutely necessary to use an oil whose "body" is suited to your piston clearance.

In our chart of recommendations printed in part on the right) we becify oil of a "body" suited to the (printed piston clearance and other lubricating conditions in each motor.

The oils themselves are scientifically manufactured from the crude bases best suited to motor car lubrication.

They are thoroughly filtered to remove free carbon and other impuri-

If you are particular about your fuel, and your carburetion and igni-tion, the grade of Gargoyle Mobiloil specified for your car will put an end specified for your car will put an end to unnecessary carbon troubles.

Motorists often select their lubricating oil with an indifference that is lit-tle short of reckless. The penalty is paid in a multiplicity of motor

If you use oil of less-correct "body," or of lower lubricating quality than that specified for your car in our chart, unnecessary friction must result. Serious damage will ultimately follow.

In buying Gargoyle Mobiloil from dealers it is safest to purchase a full barrel, half-barrel or a sealed fivegallon, or one gallon can.

Make certain that the name and our red Gargoyle appear on the container.

A booklet, containing our complete subtricating chart and points on lubricating chart and points on lubricating will be mailed on request.





VACUUM OIL CO., Rochester, U. S. A. BETRUIT SOUTON NEW YORK CHICAGO PHILADELPHIA INDIANAPOLIS MINNEAPOLIS PRES MA Pulsas St. 20 Brogstray Phile Mig. 44 Chieras Sa. Indiana Philas Size. Primous Mic.

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## Won't Freeze Onto the Pipe or At Nut or Seat

Because they are Sherardized after threading, a new process which gives surface and threads a "skin" of zine alloy, on the same principle that case hardening alloys the surface of a

Galvanizing a fitting does not protect threads because threads must be cut after galvanizing is done,

Ends are tapered at the threads to the Briggs standard taper of pipe.

This permits screwing up the Mark Union the full depth of threats. When you screw ordinary unions having a straight thread onto taper-thread pipe, only a few threads are in meth, leaving a nasty pocker at each end to fill with dirt and to corrode and freeze into a solid mass of rust.

#### Mark Unions Are Cold Drawn From High Grade Box-Annealed Deep Drawing Open Hearth Strip Steel

This is the first time a rolled steel product has been used in making a pipe union. All other unions are either gray iron, malleable iron or brass castings

You know the unavoidable defects of any cast article-blow-holes, sand-holes, unevenness, brittleness, brittleness, evenness, brittleness, etc. All these defects are absolutely avoided in Mark Cold Drawn Steel Unions,

Only the very highest grade of flawless, tough, homogeneous steel will stand the series of cold drawing and upsetting processes through which the Mark Unions must go. Every draw is a severe inspection test, and every draw also toughens the metal.



The last operation on the male end forces the cold metal into the tool steel die with such a tremendous pressure that it densifies the seat, rendering it almost glass hard.

When the union is screwed onto the pipe this densified steel seat is pressed into a soft brass seat ring, making an absolutely steam-tight joint.

Both steel seat and brass seat ring are formed with such absolute ac-curacy in hard steel dies that no machining is necessary. This means that all Mark Unions of any size are absolutely interchangeable

These are only a few of the many important points about Mark Unions.

When sending for our literature give us the name and address of the dealer from whom you buy most of your pipe fittings

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# **ELECTRENE**

responded promptly; but the fire had already been

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#### Trade-mark Notes

Trade-mark for Wrapped Tooth Picks,— Assistant Commissioner Tennant in the case of Lowenstein v. Hers has affirmed the on of the Examiner of Interferences canceling trade-mark registration No. 73,-562, to Alexander Hers, the Assistant Commissioner holding that the trade-mark, which consists of two short parallel lines ade of transverse grillings or corrugations connected by a relatively long line of such corrugations, is but a feature of the pack-age incident to an old and well-known method of sealing the same and so not espable of adoption as a trade-mark.

Color as a Trade-mark Feature.—In the case of exparts DeWitt Wire Cloth Company, the Commissioner of Patents in affirming the decision of the Examiner of affirming the decision of the Examiner of Trade-marks to the effect that a trade-mark for wire rope described as a fiber once in the wire rope, which core is solored pur-ple, is not registrable, where it appears that it was old to use cores for usuch ropes made of asbestos, of fiber scaled in tar and of tarrod hemp or Manila rope, refers to cer-tain patents, granted before the applicants ed date of use, which show wire rope claimed date of use, which show wire ropes having fiber cores, and said, "These ropes have a color which, it is true, is different from that said to be used by applicant; but, as pointed out, the registration of this mark would give applicant a prima face right to stop any other person from using a rope having a colored fiber core and for this reason the mark is believed to have been properly refused registration by the Ex-ammor of Trade-marks."

Trade-marks in Cuba and Paraguay.-Consul General James Linn Rodgers, of Havana, advises American manufacturers erchants to register their trade and merchants to register their trade-marks in Cuba as soon as possible. In Cuba priority of registration gives the ex-clusive right to use a trade-mark. The consequences of this law have been grievous consequences or this law have been grayous for more than one manufacturer. For ex-ample, the trade-mark of one of the oldest piano firms in the United States was regis-tered by a Cuban dealer and thereby became his exclusive property. Practically the only course left for the plane company is to purchase from this dealer the right to is to purchase from this dealer the right to use the mark in Cubs. It is obvious that there is nothing to prevent the registration of popular trade-marks merely for the purof making the manufacturer buy privilege of using his mark in Cubs. Re-peated efforts have been made to have this eature of the trade-mark law amend

but thus far without success. Similar conditions are reported by Con sul Cornelius Ferris, Jr., of Asuncion, wh writes that American manufacturers should realize the need of protecting their trade marks in Paraguay by registration. Regis tration alone gives the right to the exclu use of a mark in Paraguay. Formerly many American manufacturers thought the ossibilities of trade in that country did not warrant the registration of their marks. Now some of these manufacturers have made the unpleasant discovery that when made the unpleasant discovery that when they want to sell their goods there they can not do so without coming to terms with some persons who have already registered the marks of the American manufacturers in question. Since priority of registration is practically the only test as to the right use a trade-mark, promptuess is advis-

The Hump Trade-mark .-- The Court of Appeals of the District of Columbia, in The Hump Hair Fin Company v. The DeLong Hook and Eye Company, has reversed the decision of the Commissioner of Fatents surtaining the opposition by the DeLong Company to the registration by The Hump Hair Fin Company of the trade-mark presented, and including the words "the hump," and in so doing held that the fact that two articles are included in one of the cleases established by the Commissioner of Patents under the act of May 4th, 1900, does not of itself make these articles of the same descriptive properties; that hairpins and hooks and eyes are not goods of the same descriptive properties because one could not possibly be used for the purpose to which the other is applied so that then Appeals of the District of Columbia, in The

PATENT ATTORNEY

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## INQUIRTES

Inquiry No. 9210. We noted agint was core has included to the state of the state of

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t.—In the case of United States ward L. Chott v. E. B. Moore maissioner of Patents, and A. G. Wills. Primary Examiner United States Pat-Office, the Supreme Court of the Tilem. Teinany Kenninas United States Patsial Cilles, the Sugression Court of the Distoks of Columbia in positioned to great a
write of mandamen to casses the issue of a
patent to Chott. The application for pateits, which relates to a dantal broadholder, was finally released by the primary
causiner and appeal was filed to the board
of anaminer-shoulded, who reversed the
prinary causiners' desides upon the
ground that the references olded were from
a mon-analogous art. The examiner thereupon made a further search and rejected
the claims upon other references and reaupon made a further search and rejected the claims upon other references and reacus, and his action re-opening the case for the purpose of introducing additional references was approved by the Commissioner. The Commissioner of Patents also took up The commissioner of Facents asso took up the case for personal consideration of the morits of the alleged invention claimed, concluded that the application set forth nothing upon which a patent could prop-erly be based, rejected the claims, refused a patent, and said that appeal from his de-cision to the Court of Appeals should be taken, if at all, within the time prescribed by the rules of that Court. It is contended by the rules of that Court. At is contended in behalf of the petitioner that the authori-ties cited by him at length render it clear that the primary examiner could do noth-ing in the application in question, after ed by the examiners-in-chief, ne application. Further, that but allow the appli the Commissioner has no authority to pass upon the validity and patentability of claims unless the question comes to him by regular course of appeal, and attention is

omined to the Suppreme Court decimen in zerol. Miller v. Raum, in which it was held "When a subordinate officer is over-ruled by bls superior officer having appoilate jurisdic-tion over bim, his duty to obey the deciden of such superior is a ministerial duty who he eas be compelled by mandamus to perform."

The case at this writing waits the decision of the Supreme Court of the District of

The point involved seems to be whether favorable decision of any of the tribunals of the Patent Office can be set saide. In a oited precedent there was a strong dissent-ing opinion, and the writ if issued may affect a practice which prevailed for some affect a practice which prevales for some time of reviewing cases favorably passed upon by principal examiners and which re-sulted in withdrawing numbers of applica-

Bakelite Patent Recognition.sult of negotiations between the General Bakelite Company and the Condensite Company of America, the suits brought by the former against the latter and its custom-ers for alleged infringement of the Bakelite patents have been withdrawn, and the patents have been withdrawn, and the Condensite Company, recognising the pioneer abaracter of Dr. L. H. Baskekand's work, has acknowledged the validity of the Bakelite patents in suit and some others, and will pay substantial royalties thereunder. The General Bakelite Company will continue the manufacture of Bakelite under its numerous patents, and the Con-densite Company will manufacture Condensite under the Aylsworth patents as well densite under the Ayaworth patents as was as the license just granted for such of Backeland patents as are broad enough to cover Condensite. This recognition of the force and validity of the principal Backeland patents by the only other manufacture land patents by the only other manufacture of condensation products is a confirmation of the Bakelite Company's claims for the broad scope and pioneer chanceter of these patents. There is much that is old in the sat of misting phenoids condensation products, but if the Heavisland was the first to make principles application of what therefore had been elikely inhoratory experience.

Some Adjudicated Patents.—In Moreo-State, station 2 of the State patents, No. 3,005, by a descript intrement has been to a inclusive the Chesteau patents, 220 MM, or existently device has the high and fulfilland in Chesteau State high and fulfilland in Chesteau State high and fulfilland in Chesteau State high case of the contraction of the State high case of the contraction of the contraction of the State high case of the contraction of the cont

appearance for storing and distributing acceptance gas expired June 30th, 1910, with the expiration of the British patent, No. 20,750 of 1890, to same patentees for same invention; also held not infringed in Commercial Acetylene Company v. Schroeder: the Richardson and Langston patent, No. 699,489, for an improved railroad mileage theiet was held not infringed in Exchange Borty Book Company v. Rand, McNally & Co. the Stewn patent No. 683 900 for a Sorip Book Company v. Rand, MoNally & Co.; the Starr patent, No. 688,909, for a cutting instrument has been held valid and infringed as to claims 11, 10 and 20 and void for lack of invantion as to claims 1, 10, 12, 14 and 21 and not infringed as to claims 16 and 17 in Houser v. Starr; in St. Clair Foundry Company v. Union Jaok Company claims 2 to 5 inclusive of the Cox patent, No. 686,591, have been held void for auticlustion in the actor act and claim. antidipation in the prior art and claim I not infringed if conceded to be valid; the Merr patent, No. 722,030, for a combined electric measuring and indicating apparatus has been held not anticipated, valid and infringed in Minerallac Electric Comp infringed in Mineraliae Electric Company
v. Cleveland Electric Illuminating Com-pany; the Starr patent, No. 768,158, for a machine for cutting curves has been held void as to claims 9, 10, 12 and 13 for lack of invention over a prior patent to the same patentee in Houser v. Starr; in Cheathan Transit Device Company v Transit Device Company v Transit Development Company, the Cheat ham patent, No. 917,541, for a switching nam patent, No. 917,541, for a switching device has been held valid and infringed and the Lawson patent, No. 983,295, for a gem setting has been held void for lack of patentable invention in Lawson Metal Products Corporation.

The Court of Appeals of the District of Columbia in the case of the Commissioner of Patents, ex rel. Colburn Machine Glass Company, has held that a mandamus issued by the Supreme Court of the District of Columbia, compelling the Co sioner of Coumbia, competing the Commis-sioner of Patents to vacate certain pro-ceedings in the Patent Office, was im-properly granted, since under the circum-stances of the case the Commissioner had authority to do the thing complained of.

of Union Tank Line Company v. American Car and Foundry Company, claims 14, 15 16 and 17 of the Van Dyke patent, No. 768,888, have been held valid, and infringed.
The Burger patent, No. 872,795, for improvement in double-walled vessels has been voided for lack of invention in American Thermos Bottle Company v. American Ever-Ready Company. In Westinghouse Electric and Manufacturing Company v. Sutter, the Stanley patent, No. 469,809, for a system of electric distribution was held not infringed; in Ochring v. William Gar-dam & Son, claims 1 and 3 of the Ochring patent, No. 560,171, were held valid and infringed; in Emerson & Norris Company v. Simpson Bros. Corporation, the Stevens patent, No. 624,563, for a process of mak artificial stone was held valid and infring e of making in Metal Stamping Company v. Gerhab the Worrest patent, No. 662,050, for a thill coupling was held not infringed; the Tingoupling was held not infringed; the Ting-ley patent, No. 787,010, for a patch for rubber tires was held invalid for prior use of the device by others in Horsey v. Con-sumers' Auto Supply Company; and that the Robertson design patent, No. 29,993, for a design for a bath-tub seat was held invalid for lest of patentable novelty and invalid for lest of patentable novelty and invention and also of the ornamental qual-ity conscital to a design patent in Buffalo Specialty Company v. Art Bress Com-pany. pany.

Font of Type Design Case.—Assistant Commissioner Tennant, in ex parts Westh-erly, has held that when a design for a foat of type differs from the references principally in making the heavier lines h pally in making the heavier lines heavier and the lighter lines lighter and the coripha-sharper, and the change on the whole gives the type a more pronounced or holder effect, and it is shown by affidavius that the offere, and it is shown by affidavish that the type has been recognized by the trade as lawing a distinctive five, that such design is now and commental and that for produc-tion required the enterior of the inventive families, and the Andriant Consuctions femilies, and the Andriant Consuctions



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#### nce and Modern Merchandising-II How Price Maintenance Benefits the Public By Waldemar Kaempffert

FT HIS is the second of a series of short articles intended to set forth in a simple incus the consonic necessity of fising and maintaining the retail price of certaining of manufactured products. Merchandleing methods have changed in the last irrently years—changed chiefly because notion-olds and world-cide ceiling has been made possible by advertising. In this remarkable development of business, consonic made possible by advertising. In this remarkable development of business, consonic made possible by advertising. discoveries have been made which are not yet reliefly known. It is these criticis to set forth those discoveries so far as they affect price Formal.

Independent manufacturers insist that cents the very blades for which you have the more efficiently and widely their goods been accustomed to pay \$1. The saving are distributed, the greater is the benneit is considerable, and accordingly you buy to the public. If hardware is concentrally your blades at the chain store. the public. If hardware is concentratto the public. If hardware is concentrated either in storerooms or in a few large department stores, it is made difficult for the buyer to purchase. He must always rely on the nearest distributing point. If that distributing point happens to be a department store several bundred miles away, he is delayed, often needlessly, in statisfying his wants. Distribution is the art of reaching the consumer; not the art of making the consumer reach the manufacturer.

The modern merchant realises that the greater the number of retailers who handle his goods, the more accessible will his wares be to the public, and, therefo the simpler will be the problem of dis the sampler will be the problem of this ribution. But to secure the widest pos-silde distribution, the many retailers who exhibit his wares for sale must stand on an equal footing. In other words, they
must all leable to buy at the same wholeale price; they must all sell at the same retail price.

That end is attained by so adjusting the rhat end is attained by so adjusting the selling price of an article that it yields a fair profit to the manufacturer and his distributors, and yet induces the public to buy because it is low. The selling orle must be maintained, so that the Broadway shop deals with the public on the sam

terms as the general store of a village Rural communities should not be obliged to pay more for merchandise than people who dwell in cities, yet with open prices they are often compelled to do so A widely-advertised watch that sells for a dollar all over the United States cometes with a watch of about the sau ercial value, but which is not sold at a fixed price. While the dollar watch in question can be bought anywhere a one price, and the retailers who sell it al make the same profit when they buy it is the same quantities, the competing watch is said in the larger cities by the larger dealers at 98 cents and elsewhere at prices ranging from \$1 to \$1.25.

What happens when prices are cut an oods are sold at a distinct loss by a mail goods are sould at a distinct loss by a man order house or a chain store? Suppose that you need a dozen new blades for you safety razor. You have been accustomed to paying one dollar for them—a price which has been established because means a fair profit to the manufacturer and to the retailer. A chain store in your town advertises that it is selling for 6

S PRUCE gum is one of the minor for-ost products which is generally not taken into consideration by the forester in this country. In Enrope a strict ac-count is kept of such small incomes and an effort is made to develop the minor yield, together with the major produ The gathering of the spruce gum con tutes an odd phase of the north woods man's life and to him often represents a comfortable livelihood. Spruce gum is a product of red spruce of the northeasters States. Maine, New Hampshire, and Ver mont contribute largely toward the an-must yield. The sum costs out through abrasions in the bark, smally caused by borers and frequently by reachs or checks in the bark-due to the unequal thawing after excessive cold of the winter. The for plugging up the heles or cracks in the s through and often forms vari ous fantastic shapes upon the bark of the trees. At first it is soft whitish and

When next you have occasion to buy a dozen safety razer blades, you find that the corner druggist from whom you once bought no longer carries them in stock Why? He was unable to com the chain store. The chain store has long since consed to advertise the razor blade Still, you try to purchase a set there. At the cutlery counter you are told that the razor blades are no longer carried in tock. If you want a set you must write directly to the manufacturer for them.

While this is a hypethetical experience while this is a hyperhetical experience it is one that actually occurs frequently. Only the price of a very widely-advertised nriled is cut, one which is bought because of its acknowledged merit, one which is guaranteed by a reputable maker. If the retailer fluids the detailer of the price the demand for that article suddenly extinguished because a department store is offering it at less than cost, he is com-pelled to discontinue its sale. His stock is usually so small that he cannot sell other less well-known goods at so large a profit that he more than reimburses himprofit that he more than remnurses him-self for any loss that may be incurred by selling a widely advertised razor blade at less than cost. Thus, the clitzens of a small country town who were at one time able to luly a thousand different adver-tised wares -hats, shoes, hardware, and package food-stuffs-at exactly the sam price as the citizens of every other com munity in the country, are compe deal with a distant mail order house. And thus the way to a distributing trust is paved, a trust composed of department stores and mail order houses, who may dictate to manufacturers.

If the mail order houses, the depart-ment stores, and the chain stores were willing to sell well-known guaranteed articles at a loss, year in and year out, if manufacturers were willing to countenance this trade on their own good name it might be possible to advance an argu ment or two in favor of the practice. price cutting continues only for a short Its chief purpose is to attract trade, to give the impression that other articles, on which great profits are made are sold at an equally low rate. that purpose is attained the price-cutter drops the undersold article from his stock. Hence the public finds it very hard to buy the desired goods at any price.

commences to turn red, when it is fit to be gathered for market.

The gam picker frequently spec

time during the spring going about mark ing and scarring the trees, so as to mal sure of finding enough gum to pay for his labor when he calls around a yes his more when he cains around a yeer of two later This is done by elimbing a thrifty irre to above the old limbs and high in the soulight, and searring the south side of the trunk between the whorls of brunches with deep inclines shaped like the letter V. Making arti-ficial provision for the exudation of spruce gum in a systematic method has only recently come into practice. thrifty trees rarely have gus Healthy m on the It is found on trees that have been tunted from some injury, or are infested by insects, or otherwise diseased. Occasally one will find a tract where nearly all spruces yield gum.

It is said that the be pitchy, but after the intense cold of the day from 8 to 10 pends of craffic garden and fars where the because hard and changes though from 8 to 10 pends of craffs garden where it becomes hard and changes though from 3 to 5 pends constitutes as a darker hue. After the first year the fair day's work. By the time the garden is a darker hue.











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cleaned it will shrink about one fifth in weight, which is worth from \$1 to \$1.50 a pound. The best grades of gum frequently bring \$2 a pound. Bangor, Maine, quently bring \$2 a pound. Bangor, Maine is the principal trading point for spruce gum. Many tons of it are shipped from here every year, and the bulk of it is sold in New England, where the gum chewers much prefer the spruce gum to that kind which is manufactured from parafin and

#### Novel Uses of Compressed Air (Concluded from page 9)

S, only one being shown, and opposite to them there are two idler rods, designated I, which are differentially geared to the shifter rods through the pinion G. The selector finger F, which is made integral with the piston rod PR the piston P and with the piston rod PR the piston P and the long pinion PL fits into slots in these shifter rods and idler rods when rotated through the smaller pinion meshing with the pinion PL; this smaller pinion is coned to the steering column indicator.

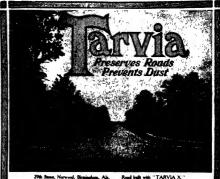
The air distributer is controlled by the clutch position. With the clutch engaged, the valve is closed; when the clutch is disengaged the valve is in the position shown admitting air behind the piston and forcing it back. In action, a neutral col-lar on the piston rod, on its backward movement, throws all the rods to the neu-tral position. Depression of the clutch pedal first closes one port and then opens communication with the other, forcing the piston forward, the selector finger drawing the rod selected by the steering col-umn indicator. The action of the device, therefore, is first to place the gears in the neutral position on the downward pres-sure of the clutch pedal and then to ensure or the clutch peak and then to en-gage the gear indicated by the steering column indicator on the upward move-ment of the clutch pedal. It is possible, however, to slip the clutch, without the necessity for changing the gears, a certain amount of leeway being provided for this

The particular advantage of any sys-tem of the kind, aside from the fact that it eliminates a certain amount of manual labor is that it permits the driver to have moor is that it permits the driver to have both hands on the steering wheel at all times. It also is possible to anticipate a gear shift. In ascending a hill, for in-stance, the steering column indicator is set for intermediate speed while the car is running on high gear and then the next time the clutch pedal is fully depressed. intermediate gear automatically gaged without further work on the part of the driver. To prevent reverse gear being engaged when the car is running forward, the reverse position is protected by a latch and to facilitate night driving the indicator is illuminated by a small

#### Fuel Production in the United States

underlie North Dakota (besides a vast tonnage in other States) until recently was considered to be worthless for any thing but the most local consumption. It is now known that all this coal ranks high as a gas-producer fuel, being more effi-cient in the gas-producer engine than the best Pocahontas coal under the ordinary steam bolier, and furthermore that it can be made into high-grade briquet fuel by simple pressure, without the use of the expensive "binder." Again, our present expensive "binder." Again, our present total estimate of thirty-two hundred bil-ilon tons of coal in the United States (exclusive of the great deposits of Alaska) clusive of the great deposits of Alaska) takes into consideration coal to the depth of only 3,000 feet. Coal lying beneath that depth is classified by the Geological Survey as "non-coal," however thick she Survey as "hon-coal," nowever thick sae seem or high-grade the quality. Yet Bel-gium is operating a mine but a few feet short of 4,000 feet in depth, and Germany estimates her coal reserve on the basis of a 5,000-feet depth

a bottom rest depth Finally, approaching the subject from the slant of the most economical use of the ton of coal after it is mined and de-livered to the power-plant or the factory; only a small proportion of the stored,



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# The Ten Greatest **Inventions of Our Time**

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Perhaps because we have become accustomed to the use of the old machines and discoveries, perhaps because the achievements of latter-day inventors succeed one another so rapidly that we are not given much time to marvel at any one of them, we have not fully realized how stirring and wonderful are the products of modern ingenuity.

Only five years ago the man-carrying aeroplane made its first public flights; only the other day hundreds of passengers on a sinking ship were saved with the aid of wireless telegraphy. At least a dozen inventions as great have been perfected in our own time, and all of them have made a man's work count for more than it ever did before, and have made the world more livable than it ever was.

Why should we not tell the story of our own deeds? Why should we not review the industries created by men who are still living, men whose names will go down into history with those of Watt, Morse, McCormick and Howe?

That was the underlying idea of the November Magazine Number of the Scientific American. We knew that the "ten greatest inventions of our time" was a big subject when first we planned the number, but how big it was we never realized until we surveyed the field of modern invention.

Then we saw how astonishing was the progress made in our own day, how much mankind had benefited by the inventions of great modern intellects. We began to appraise inventions, to weigh one against the other, and to determine in our own minds which ten had contributed most to human progress and happiness, which were really great pioneer inventions, and which merely remarkable and valuable improvements on successful past conceptions. There were so many achievements to consider that it was hard to arrive at a definite conclusion.

The upshot of our own thinking has been to leave to our readers the decision

# What Are the Ten Greatest Inventions of Our Time, of applied science, but also in the prose and Why?

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On another page of this issue are printed the rules that will govern the contest.

energy in the coal lump is utilized to-day the railroads use annually about 90,000, 600 tons, yet it is estimated that not more than 10 per cent of this energy is utilized to drive the engine winels; and this is far more than formerly. No one can doubt that during the next gen doubt that during the next generation there will be vastly more use and less waste in every phase of the industry ranging all the way from the mining, to the final application of the power. The present up-to-date plant, for instance burns its smoke and saves the power it wont to waste into the atmosphere, a fuel bill and a greater gain to the p in the absence of dirt. Directly and in-directly the smoke anisance is estimated at the country between \$250,000,000

#### Observations of the Companions of Sirius and Procyon

IN No 648 of the Astronomical Journa Prof. E. E. Barnard of Yerkes Observa tory publishes his results on his "observations of the companions of Sirins and Procyon." Because of the great bright of the principal star in each case which is particularly troub the air is not perfectly steady, conditions have seldom been good for observing for such oldects as the companious of Strius and especially the close companion of

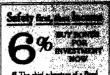
In the present observations of Sirius it has seldom been necessary to use the hexagonal disphragm (A N., 4845). with it Under good conditions the small star is a very bright and conspicuous ob ject. A little disturbance in the air, how ever makes it faint or invisible. The folwing ure the measures of the companio of Siring

82.34

Schaeberle's Companion of Procyon. Schaeberle's Companion of Procyon. Schaeberle's companion of Procyon is a far more difficult object than the com-panion of Sirios. It requires the best condition even to see it. At the present measures, though difficult to observe, it seemed to 1 Prof. 1struard to be brighter than for some years past. The hexagonal vation, and was invertably used. companion is now perhaps slowly closing in on the bright star, as indicated by the If this is true, observation of it will become more difficult and perfavorably placed in its orbit. The angutar motion of the small star seems to be increasing somewhat and is now betw 5 degrees and 6 degrees a year. ing are the measures of Schaeberle's com-

# The Current Supplement

Tills week's issue of our Supplement brings an article of nunsual import ance and interest from the pen of Prof. Birkeland, who has become famous as the foremost among the rather small body of men to whom the new industry of the manufacture of nitrates from the air owes its existence. Prof. Birkeland bas achieved greatness not only in the world of applied science, but also in the prosecharacter. For some time past he has been conducting a remarkable series of experiments in which he has reproduced on the laboratory scale certain ph observed on the sun, such as the co the sunspots, etc. His article on "The Origin of Worlds" is one of the most remarkable publications which we have had ecasion to place on record for some past.—H. F. J. Porter writes on life has ards in crowded buildings and the means to be employed to reduce such risks to a minimum.—A Diesel engine of French manufacture is described.—Dr. J. J. Dobbie tells us of the services which the sp troscope has rendered the organic chemi



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(12820) E. N. asks: Kindly tell me (126740) m. N. asaxa: E.Indly seu me what is the velocity of electricity, and also the relocity of light. A The velocity of electricit waves through space is the same as that of light. The velocity of a surrent of electricity over a wire is very much slower. It varies with the indensity of the electricity and the size of the

where (12921) W. F. F. aaks: A light ball, when placed in a strong jet of aft issuing from the ordine of a nearly vertical pipe, will find a position of equilibrium and remain there suspended, even degrees to the vertical. The same thing occur if other fittids he used, as air, steam, sec., but the maximum anades of inclination decrease with the maximum anades of inclination decreases with the varieties. The singular resolution of a ball upon a jet of air or wavener is explained by the adherion of the fluid to the ball, both receiving the ball and drawing the strought he ball in the direction in which the strough the ball in the direction in which the strough the ball in the direction in which the strough the ball in the direction in which the

next with the stream of water or air.

(12822) J. C. A. adict: In the case of lett's adjacents buildings separated by a merror of the stream of the buildings facing on lane are penetrated by nanay windows. There is undestinedly a smassion of the outsidings facing on lane are penetrated by nanay windows. There is undestinedly a smassion of the entrance of more light, but is this sensation, the stream of th

which tails upon it, while a red wall will only afve back aftenes pre-cut of the light it receives.

(1283) E. E. H. ander: I. Will you pub-lish an account in the first trever Austrian, of the method used in graduating surveyors' instru-ments, transit, seatants, etc.; Into degrees, min-tures, vot.? A The circles of transits, and other surveying the curvature are graduated by the dries and a tool which graves the lines as the circle and a tool which graves the lines as the circle and a tool which graves the lines as the circle and a tool which graves the lines as the circle which is too be graduated is turned around under this tool. Your question seems to refer to the method of sansain; the dividing cention rather the method of sansain; the dividing cention rather difficulty lies in gesting the first circle divided coursely. After that the copying of this circle presents no difficulties. If you wish to eart at the beginning and graduates a circle with divi-dent, the half, quarters and statis, or the circle of the circle of the circle of the circle of the circle which of the circle of the worker made for sealth 1 cannot find anything shading a seventia number of spaces out of much be dividing them into one more space. Thus, if the ventice made for sealth 1 cannot find anything shading a seventia number of spaces out of much be dividing them into one more space. Thus, if the circle were divided into half degree, or 30-minute spaces, a warner to read single minutes would be conserved by the size proposed. (1) and the stellar (1284) J. M. B. asker Leat Sunday, Juste 1s, I saw electric waves on a colours him to

called a direct-residing version, which is the form sensity fround on instruments.

(12824) J. M. B. asker: Last Sunday, June 19, 1 are selected wave on tolograph line. Will you please tell me if there is any record of offence was the form to me one libert has district. Will you please tell me if there is any record of offence was the form to me one libert has district. The contract was the form to the selection of the form of the for 

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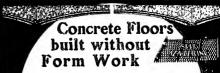


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This is gratifying to us not only because the co-operation of our subscribers is of the greatest assistance to us in increasing the circulation of the "Scientific Ameri-can," but also because it shows that the improve-ments made in the publication meet with the hearty approval of its readers.

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NEW BOOKS, ETC.

THE GAROLINE MOTOR. By Harold Whit-ing Slauson, M.E. New York: Outing Publishing Company, 1913. 16mo.; 163

The Man and the Woman. Chapters on fluman Life. By Arthur L. Salmon. Chicago. Forbes & Co., 1913. 12mo.; 145 pp. Price, 75 cents.

THE POSTURE OF SCHOOL CHILDREN. With Its Home Hygiene and New Efficiency Methods for School Training. By Jesse H. Bancrott New York: The Mac-milian Company, 1912. 8vo.; 327 pp.: illustrated Price, \$1.50 net.

mustrated Price, \$1.00 net. The author has given us a very thorough discussion of posture in its relations to energy and health. The dangers of "overcorrection" are pointed out, and it is sought to inculent true itself by plates reproducing paintings and sculptures aboving natural and graceful modes of standing and waking

MOVING PICTURES. How They Are Made and Worked By Frederick A. Talbot. Philadelphia J. B Lippincott Com-pany, 1912. Svo.; 340 pp., illustrated. Price, \$1.50 net.

POULTRY FOODS AND FEEDING. A Manual for all Breeders By Duncan Forbes Laurie. New York: Cassell & Co., Ltd., 1912. 8vo.; 188 pp. Price, \$1

of looks with extract from issuing authorities. By John Foater Praser. New York: Cassed & Co., Lid., 1913. Neo; 291 pp.; with map and 48 plates from photographs. "I the state of the state

reads the story

DYRE'S AUTOMOSILE ÉRCYCLOPEDIA. Third Edition, Revised and Enlarged. In 40 Distribution, Revised and Enlarged. In 40 Distribution of the story o

Science From an Easy Chair. A Second Series. By Sir Ray Lenkester, K.C.B., F.R.S. New York: Henry Holt & Co., 1913. 8vo; 412 pp.; 55 illustrations Price, \$2 net.

Frice, \$2 net. Those general readers who have seen the lirst series of these charty inscens will not be instruction of these charty inscens will not be inspected in the second volume. Rich in information, it is still richer in suggestion, and hould be placed in the hands of all those whom is desired to interest in natural science. In still, the still richer is suggested, with a still richer the paper deal with such subjects that the thing is the still richer than the total a band, food and cookery, must not in the total a band, food and cookery, and perfame kines, insujher, and fatherless rough we give some lides of the scope of the work.

The Laving Plant. A Description and Interpretation of its Functions and Structure. By William F Ganong, Ph. D New York: Henry Holt & Co., 1913. &vo.; 478 pp., illustrated. Price, \$3.50 net.

Price, \$3.50 net.

The first thing that impresses us on taking up this volume is the excellence of its nucleanies up this volume is the excellence of the nucleanies are making and a portual of the contential position of the contential position of the contential position of the content of th

HE MOTOR AND THE DYNAMO. By James Loring Arnold, Ph.D. Easton, Pa.. The Chemical Publishing Company, 1913. 8vo.; 178 pp.: illustrated. 1913. Nvo.; F78 pp.: Hittstrateu.

This is a text book designed to convey the sore important facts of electrical theory. It shouldes the results of years of experience in stecking, and modern types of machines are

THE NET LYTERNACHOMAL YEAR BOOK.

ACCOMPACTION of the World's Propress for the Year 1912. New York:
Dodd, Mead & Co., 1913. 8vc.; 532
pp.; Illustrated.

This Year Book, though instreasional in scope,
makes an especial appeal to American reader
by its multiple and the second property of the continuation of the continuation of the second property of the second prope

ACCULATIONS ON THE ENTROPY-TEM-PERATURE CHART, By W. J. Chawford, D. Se. Philadelphisi: J. B. Lippincott Company, 1912. 12mo.; 74 pp.; 52 illustrations. Those explanations are written for students who wave lacked time or coppetunity to drive deeply not underlying principies. To quote the subner, it is abused to return down not understand all the recommend of its manufacture."

PROCESSES of INBUREATIVE.

PRACTICAL LOCOMOTIVE DYRRATING. BY
Clarence Roberts and Russell M. Smith.
Philadelphis: J. B. Lippincott Company, 1913. 12mo.; 292 pp.; 92 Illustrations in text and 6 inserts. Price, 82 net.
Mr. Robers is usefuln readinteraction. The company of the price of

heaters, brick arches, and improved valve gars

The Making or A Grach Canadia, Nathwar. By Frederick A. Talbot. Philadelphin: J. B. Lup Bustander, Prince, R. Luwar. By Frederick A. Talbot. Philadelphin: J. B. Lup Bustander, Prince, R. LuChandels possible in many wars our own
cather triumphs over water and vild. The author
epont the greater part of the year 1910 in travening—by pack-borne and canon when other means
failed—the route of the Grach Trust Fredfic. So

Intimately did he minist with the outdoorse, teamstern, and graders, that his rectued of their hadder
and their conquests is very appealing. It is not so
gives us, but the main features of the undertaking
in their relation to humans endeavor.

Text-Book of Desion. By Charles Fabons Kelley and William Luther Mowil. Boston: Houghton, Miffin Company, 1912. 8vo.; 134 pp.; illus-trated. Price, \$2 net.

The BULDING AGE HANDE ESTIMATE
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men instance the estimator with heat to nervice as
the second section of the work goes into matters
with great thoroughness and scenario.

THE MAKING OF THE EARTH. By J. W. Gregory, F.R.S., D.Sc. New York: Henry Holt & Co., 1912. 16mo.; 255 pp.; illustrated. Price, 50 cents net; by mail, 56 cents.

Manual of Qualitative Analysis. Reservant and Combustion Methods. By Wilbur F. Hoyt, A.B., A.M. New York: The Macmillan Company, 1913. Price, 30 cents.

THE "SELPTING WORLD" YEAR BO-1913. A Deek Manual in Tra-Commerce, and Newhation. Ex-by Evan Rowland Jones. Lead The "Shipping World" Offices, 18 8vo.; 1848 pp.



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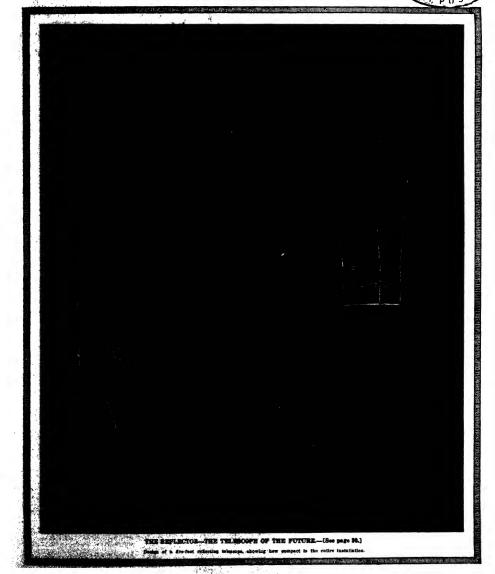
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## SCIENTIFIC AMERICAN

NEW YORK, SATURDAY, JULY 12, 1913
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The folior is always glad to receive for examinable illustrated articles on subjects of timely interest. If the photographs are shally the articles wind, and the facts authoritis, the contributions will receive shorn attention. Accepted articles will be paid for at regular space rules.

The purpose of this fournal is to record accurately, simply, and interestingly, the world's progress in scientific knowledge and industrial achievement.

#### Panama Canal Architecture

The reasoning to learn from the last bear of the transma Conel Revord that the urchitectural features of the Phanna thank, both as to landscape and buildings, are in the hands of an architectural firm of note, the character of whose past work is a guarantee that the Phannan Caual is not to be belifted by anaster architecture.

Too often in the next American engineering works to maximize have suffered either from devenued or missuprehension of their architectural and aesthetic requirements. The outlines sum amount of the strictly utilization principles of design which govern the captience are frequently intarquations and displaying to the eye, and do violence to an aesthetic sense whose demands are becoming more holstent with the general spread of knowledge and artistic education. Somethies, so is the case of the Brookh Bridge, a great engineering work is as ornimental as it is meaning the summarine and the case in the Williamsburg Bridge—surely the uptlest structure of its kind in existence—the result is artistically deplorable

succe-the result is artistically deployable. In our issue of February Sh of this year, we drew attention to the fact that the Yuanama Chaul was in danger of being designed by the crude character of some of the structures which were being creefed, and to prove our contention, we thinwrited a range or light tower, which had been built our the center will of the take approach to the father Locks. This structure, designed in the offices of the engineering force at the bulmans, is no dendi strong, stable and perfectly adopted to its purpose of showing a light by a certain location at a fixed elevation for all that to come, but considered as an architectural work in its about as agily and hope the structure of the content of the proposed showing a steel many content of the proposed showing a steel many content of the proposed showing a steel proposed in the content of the proposed showing a steel proposed about replaced, either is in more graceful design in the influence concerned, or live a steel more of open work construction similar in general multing to the Effect frower. We understand, however, that any change in this direction is strongly opposed by the engineer in this direction is strongly opposed by the engineer in

The Schwitzie America commonls the mittee to the sections attention of the chirmon of the latimion Count Commodom, to the longer that he will authorize the expenditure of the relatively small amount of money that will be necessary to remove the present structure from its very conspictions position and put in its place something that would be consistent with the dignity and great excellence of the engineering work at the Gatum backs.

## A Suggestion for Suburban Traffic

N a tetter in the New York Trace, Mr. W J. Wilgue suggeste a northed by which the capacity of the ratiroads which carry a large communer trafficlate and out of our office might be rendered capable of handling a larger number of passequers, on a more frequent schedule, at higher speed, and at a considerably reduced rate.

ably reduced rate.

The proposal carries additional weight when it is known that Mr. Wilgans was the oblef engineer of the New York Central Ratirond, who first proposed the utilisation of the "air rights" of the company's terminal grounds, by building a double deck station, and covering the space above with business and other city build

luga. He now proposes that the ratiroads should further utilize their air rights by building above their surface express and freight racks, elevated arriculuse reserved for a high-meed, electric, suburban service. The railroads that councer our cities with the outer world, sups this authority, have not as yet seen the wisdom of departing from the time-honored causion of utilizing the surface only of their leads for tracks. The result of running over these trucks a betterogeneous mass of trains—express passenger, local passenger, and freight, is that the express and limited rains are given the right of the road and commuter and freight trains have for drag along as best they may. This intermingling of traffic has produced such dissatisfaction among the commuting public and shippers of merchandise, that many railroad managers have publicly declared that they wish they might be suftrely releved from the obligation of serving sulturban commuties.

Another difficulty is that the concentration of local travel within the rush hours of night and morning coults in the railroad quant heing rarely used to more than ten per cent of the full cupacity; which, in turn, imposes the need for comparatively high fares with

imposes the need for Comparatively again times with which to pay unproductive Racic charges. The construction of separate overhead tracks would not only lengthen the distance to which the commuter could travel within an hour's time, but, though suffiable cooperation with municipalities, the old-fashioned concentration of travelers at congoned terminal contest might be replaced by a system of murginal subways, or sevurded routes, that would permit of a roady circulation of travel in the cities, with frequent stops in the business and manufacturing coulers. To cheepen the cost of sevice, a graduated range

To cheapen the cost of service, a graduated magof farce is suggested for the different hours of the day —comparatively high rates in the rush hours, with lessending charges before and after such hours, with lessending charges before and after such hours, with vollings shates that an increase from ten per cent of the rallrand's twenty-four hour enpacity to 20 per cent of the rallrand's twenty-four hour enpacity to 20 per cent of would cut the fixed charges per passeager in laif and reduce the total cost by some 25 per cent. By thus separating the commuter from the header and more ponderous trunk line service, by affording mobstructed recludation of runks in the clies; and by graduating the farce so us to distribute the "peak" or highest load of traffic over longer perfoles of the day, the rapidity of suburfant service would be herensed, the cost would be decreased, and a larger number of city workers with their families could live among more congenial and heulthful surroundings.

#### Is the Supremacy of the Battleship Challenged?

The present stage of the development of naval warfare the battleship is supreme, or to speak in our own more consecratively. It is believed to be supreme, in our own may, at least, it is believed to be supreme, in our own may, at least, it is below that in spite of the high degree of perfection to which the other various units of offensive and defensive warfare have been carried, the sense of a naval campiatic onto dedultely decided, only when battleship is timed up against battleship in the final supreme test

Now, nithough the general proposition that a naval ar can only be won by the destruction of the enemy's buttleship flett is undoubtedly correct, it is not countly certain that battleships can be destroyed only by bat-tleships. So great has been the development of the existing smaller units of wurfare, and so pregnant with possibilities are some of the newer means of attack, notably by the aerophane and the dirigible, that the quess us to whether the linal outcome of a naval campulan lies so completely with the battleship fleet us is commonly believed. Thus the torpedobout de-strayer hus developed in size, speed and efficiency to a point which entities it to be cuited not the torpedobont—but the buttleship-destroyer. Destroyer fleets are now composed of bonts so fast, so seaworthy, and so ubty hamfled, and they are employing tactics and de-vices so novel and bewildering to the enemy, that the time has gone by when they have to wait for the cover of alghi or fog in order to make a successful attack at close quarters. It was only last year that our daily press reported a successful attack by destroyers on a buttleship fleet, unde under the bright light of a noon-Under the methods employed, the destroyers emseives stemming at thirty knots parallel with the buttleship line at a distance of not over 2,000 yards (which is point-blank torpedo range), and they were doing this with a clear vision of the position of the enemy's individual ships, and under conditions which rendered it impossible for that enemy to locate the position of the destroyers or deliver any effective fire against them

against team. During a recent interview with a German naval officer, the statement was made to the writer that sithough the great susperiority in battleships of the British anyy would reuder it likely in the eventuality of heatilities that the Herman navy would be crushed, the high degree of efficiency of the German torpedo facet was such, that the victory would be went at a cost

which would relegate the British fleet to seemed the smoon the world's navies—a result which we seemed added to be entirely possible.

Comment.

adder to be entirely possible.

Another of the tesser units of warrars which is boiling chattenging the latticellip supremacy is this submarishs chattenging the latticellip supremacy is the submarish except have proved that the submarishe is saids, asserting the submarished character have proved that the submarine is saids, asserting the saids of the submarished character is said to the said of the

And new comes ReserAdentral Fisk with his bold proposal to substitute the 50-mile secoplane for the 15-mile submartine. Fisk would carry the torpedo strapped below the body of the ascoplane. From which it would be dropped by releasing a inteh. In delivering the atracts, the aviator likes at a high elevation to within point limits range of the battleship. Be then swoops rapidly downward to within ten or affects feet above the water, directing his flight so that on reaching the proper clevation, the torpedo bears true on the target. The fatch is thus released and the torpedo engine, started by the act of releasing, drives the missile straight for the mark.

Now every gunner knows how difficult it is to judge a range that is emplify changing hold its vertical and incircular particular that the aeropiane during its deamand right would be a matter of june good had the value of the particular that it is a superior of the the range-setter, and any gunner must admit that, if an aerophane could be built of sufficient power to carry a torpreb in the manner proposed, such a form of attack would present great possibilities.

This surfice must not be taken as a pies for reducing the size, min-nower or weight of armor of the present battlethit. We must most displacement with displacement, speed with speed, and gan wills gan, if we are not to be found wanting in the day of trial. The next five years will see a remarkable development in the three methods of attack above outlined, and it will take unother battle of Tsushima to determine whether our present. "Newndas" and "Pennsylvanias" are the lesst types to meet the average conditions of modern surface, or whether three must be a revision of types, such as resulted from the lessons of that famous consistent means of Japan.

#### Experiments in Electroculture

HE situatistion of plant growth by means of electrical curronts has now been carried on over a period of 167 years; and to this day it is hard to point on an tanglie and consist applicable results of these investigations, nor has this mode of cultivation yet entered into the ecclustrations of the ordinary agriculturist or hortculturist. In a voluminous work on electroculture recently published by Jir. A. Bruttini of Rome It is stated that 187 persons are knewn to have carried on experiments in this field. Of these, 133 reported favorable results, 21 were doubtful, while 33 found the sphileation of electricity to plants to be distinctly unfavorable. A majority of the first group employed more or less unceintified or superficial methods. Nevertheless electroculture continues to be the cherished dream of many present-day experimenters, as is stincessed by the fact that an "international Conservation of the contraction of the cherished dream of many was held at lithems last

Micrometer Observations, of Phaebs, the Ninth Satellite of Saturn.—In No. 4655 of the Astronomische Nochrichte, Prof. E. E. Barnard of Yeekes Observatory publishes the results of observations made with the 40-inch refector at a time when Saturn was 26 degrees higher on the meridian than when the stellite was sought for on the night of December 8th. After making a sketch of the 5½ 664. Prof. Barnard states, "I began measuring the Saint stars. It was then noticed that a star marked J4th magnitude, close north preceding a 12½ magnitude star was changing its postion. This proved to be Phoebe. A similar case occurred on December 81st, when I had marked 1t 14th magnitude on a statch and measured a much fainter star for the steellite." Prof. Barnard coordines that when the seeing is good Phoebe must easily lave been as bright as the 14th magnitude. "Under stalls are conflictions it should be observable with moderate absol instruments." Prof. Barnard states that the attellite is following almost in other cases.

#### Section 100

Serials show fineses Than Pro-Decadesorphia.
Shiftink source of the issue of quin-leaver for lest
alone considerable super-orenest in the maximumalone considerable super-orenest in the maximumind decadesorphic; is above also that the larger the
sea the printer is the accuracy. The percentage of his
set of rounds fixed is: for the 13.8-lenb, 79; 12-lenb,
st. 3; 2.8-lenb, 52.2; 7.8-lenb, 47.1; 6-lenb, 50.8. It is
stimuted that set out of 408,790 pounds of metal fixed from
decadenought ships, 333,000 pounds, or 57.7 per cent,
struck the terror.

Atr Ser Submariasa.—The use of peroxide of sodium for renewing the air in the confined quarters of aumarines, which was first promoted in France by Profs. Desgrees and Balthasard in 1897 and since then adopted in the British anny, has been labely tried with oxylithe on board the submarine "Argonauste" of the French fleet at the navel scatabilishment of Toulon. On this coession the submarine remained under water for 12 hours. It contained a crew of 21 officers and men, together with the two members of the testing commission, and the results as a wholes were recognized to be excelled

Pretecting Iren and Steel from Corrosion.—In an industrial note United States Consul Albert Haistead of Birmingham tolls of a process for protecting iron and steel from corrosion which was called "ferro-nincing" or 'ironizing" and is a coll clotter process. It is claimed to be suitable for coating plates, angles and channel from built up structures, tubes and cylindrical vessels, boils and nuts, small eastings and forgings. It is said to be cheaper than other similar processes, the cost being dependent upon the nature of the articles and the thickness of the coasting required.

A Tidal Ferry.—A new type of steam ferry has lately been put in use at the port of Hamburg. It somewhat resembles a craft used in England for a few years past, and is obarceterized by the fact that the main deck in movable and ona be raised or fowered by as much as 15 feet, the deek being strong enough to carry six large basiing wagons. The daily variations in the tide level at Hamburg made this kind of foreyboat necessary. Of 170 tons displacement, the new ferry is 120 feet long and 50 feet wide and carries triple-expansion engine giving 650 horse-power. When the boat enters the wharf is omes into a small and completely sheltered does

Treaty-seven Miles of Subway Constructing.—Tho last report of the Public Service Commission for the most sending June 18th shows that eighty-ne million dollars is being expended on twenty-sevon miles of the New York rapid transit subway. Since practically all of it will have four teachs, it can be said that about one hundred miles of single track is under construction. The number of the subway of the subway of the property of the subway of the subway and the center with subway and the Center Street loop between the Williamsburg and Brooklyn bridges are presticable ycompleted.

What Might Have Been.—A striking comparison is drawn by our contemporary The Nawy between our foreign trade earried in American ships in 1826 and to-day. Attention is drawn to the fact that if the water-borae foreign trade of the United States were per capital equal to that of Great Britain is would amount to \$14,-00,000,000 per annum and if our foreign carrying trade in American ships were the same proportionately as it was in 1828, when it was 90 per cent of our total foreign trade, it would amount to-day to \$12,000,000,00. Last year, as a matter of fact, it amounted to only \$322,461,556.

Two Thessand Engineers Wanted.—Attention is drawn by the Engineering Record to the fact that the recent act of Congress suthorizing the valuation of rail-ways institutes a work so large that probably about two thousand engineers will be needed to fill positions ranging from those of a minor character in field parties to the responsible work in charge of divisions. All of the positions are to be filled through civil service examinations. Engineers with the necessary testing will find it to their advantage to give the forthcoming examinations careful consideration. The salaries padd for this work will probably be at least as high as those paid by the railroad companies for similar work.

panies for similar work.

Death of a Well-knewn Shiphailder.—The recent death of Edwin S. Cramp, formesty vice-precident of the William Cramp & Sons Ship and Engine Suiteding Company, the second son of Chartes H. Cramp, marks the cash of another member of a family that will always be famotes in the srinals of American chipbuilding. It was hig grandatable, William Cramp, who founded the large shipbuilding plant on the Dalaware Elver. In these years through the company of the company of the company of the transition of the company of the comp

#### Electricity

High-frequency Generator.—According to recent pressing attended, an English segiment, William Durtual, has invented an electric generator designed to produce heavy current with an alternating frequency of some 30,000 to 100,000 ceellistons per second. If this between the contract should play an important part in wireless telegraphy and telephony.

graphy and telephony.

Bird Perchas on Line Poles.—In the rules and regulations for bare transmission lines, published by the German Association of Electrical Reguneers, it is presentised that the poles and eross arms of transmission lines bus of designed as to provide no footing for birds. In carrying out this regulation a German firm has designed a pole provided with a perch at the top on which the brade may roost. The perch is merely a T projecting from the pole proper, the latter being provided with a conical cap, so as to aford no footing for the birds. While the brackets and cross arms are not absolutely devold of rooting places they do not offer as attractive a perch as the T at the top of the noise.

An Electric Lamp for the Dark Room can be placed very conveniently beneath a transparent jease dish for use in developing plates. Photographers know the inconvenience of having constantly to remove the plate and hold it up to the tight to see whether it is finished. This can be avoided by certaing out a square opening in the bench, covering it with a glass plate, then putting one of the usual preased glass trays upon this as a support. Under the table is an electric lamp arranged to give a red light. A somewhat strong light can be used, fisshing it on momentarity by a foot or the plate of the plate witch. The usual dark-room lantern can also be retained, putting on one or the other light when need be.

Wireless Determination of Longitude.—In a paper read before the British and Prenoh electrical engineers at Paris, Commandant G. A. Ferrer described the system employed in sending out time signals from the Effect lower, whereby even an unskilled person can estimate how much his clock or watch is fact or slow to within half a scoond. He also described the recent experiments conducted between the Eiffel Tower Station at Para and the Arlington Station at Washington to determine the difference of longitude between the two otties. The experiments are to be resumed next fall, and by using photographic galvanometers with rapid vibrations superimposed by a uning fork, it will be possible to measure to within 0.001 second.

X-ray Moving Pictures.—Moving picture views made with the X-rays are quite a novelty, and the German scientiat Descuer now succeeds in producing them by an apparatus of his make which gives such powerful X-rays that be can take six photographs a second in this way, and he works a cinematograph which shows the movements of swallowing, the throbbing of the beart, and the like. The apparatus for producing the powerful X-rays employs an improved current breaker in the primary of an induction coil which gives rapid break and enables him to secure secondary current from the coil of much higher power than usual. Using this device in connection with an X-ray tube he obtains rays which enable sharp and rapid radiographs to be taken.

Direct V. Alternating Current Between Trelibetton

Direct v. Alternating Current Between Treithasten and Copenhagen.—In estimating the cost of generating and transmitting ourrent from Treithasten to Copenhagen a three-phase, 010,000-voit lime and a direct-current \$0.1000-voit law and a direct-current \$0.1000-voit system were considered. The latter which called ro 20 generators in series, under the Thury constant-current system, was found more economical and was adopted. Its chief advantage lay in the ability to transmit current under water without transformer stations, two cables being employed instead of four cables as would be required in the alternating scheme. The alternating system would sail for three transformer stations and a frequency-converter station, conversing from 25 cycles to 50 cycles. Ascording to estimates made, the continuous current system abova a saving of \$400,000 on the annual cost. The distance from Treithasten to Copenhagen is 204 miles. three miles of which I under water.

New Electric Lecomotives for Swins Railroads.—The Swins Federal railroads are non to make use of two electric bosomotives of a new type which are now in consciuntion at the Brown-Bowed works and are intended to work on three-phase current. The new locomotives have two newly-designed electric motors of 1000 horse-power size. Four driving axies are used, with driving wheels coupled on a new system, and this allowed raising the motors on the locomotive track so that they can be more resulting imported than herestofors. This also raises the center of gravity as experience shows to be necessary for good running. The trush has two non-driven axies. The driving wheels are 4 feet 2 inshes in disansets and he file wheels 2 feet 8 inches. Four speech are given the locomotive by medifying the number of pairs of poles in the motor by proper sheeriest conscious for giving 6, 8, 12, and 18 pairs as as to run at speech screening and 45 miles as hour. The locomotive can develop as high as 2,800 horse-power at full speed.

#### Automobile

Kerosene Taxable Abroad.—Whether keroseno as motor find ever is taxed in England, as several times has been instell would be the case, the possibility is at least likely. The Home Secretary recently has stated that under present laws it is taxable under the definition of motor spirit, provided it comes into general use and gives evidence of proving reasonable, officent fued

Berlin's Motor Cabs Increasing. Recent traffic returns for the oily of Berlin indicate that the number of motor cabs at present in service is 1,218, as compared with 1,050 a year ago. On a like basis of comparison, the horse-drawn variety numbered 3,288 a year ago and 2,773 at present. In other words, while the number of motor cabs increased by 153, the number of horse-drawn cabs docreased by 252.

Killing Two Birds With One Stone.—In line with the clever foreign practice of combining the manufacture of motor cars with the production of eventy machines and guns and what-not, one British dealer has developed an unusual scheme for reducing 'overlend express." He uses his demonstrating cars also for hire purposes and in this way makes them pay the expense of demonstrating, which in many cases is high.

Supplying Steam to Carbureter.—Patent No 1,050,-967, granted to Harry A. Babbatt of lattle Rock, Arkansas, provides means by which steam may be injected into the carbureter of an internal-combustion ougher for increasing the efficiency of the explosive charge and regulates such supply of steam, the steam houge derived from the overflow water from the jacket by heating it by the exhaust

A Gasoliae-electic Truck.—A somewhat novel Kurpena combassion is that of a power wagon and an electric-ear truck. The truck is designed so so to allow of carrying the loaded power wagon bubly and thus transporting it over the traumay rais to the radroad depen, where the load is charged upon the militand rans, then the empty wagon comes back by the traumay as before. This effects a saving in war, for the distance from the place where the wagon takes ou the merchanduse, to the traumay, is comparatively short. All that is needed is to modify a car truck by putting on a pair of larged channel bars in the rese which can be let down so as to form skeds upon which the power wagon may be drawn up by means of a winch.

Motering Increasing in Switzerland.—Despite the numerous obnotions law that have been leveled at the heads of motor tourists in some parts of the republic of Switzerland, recent returns show that the number of tourists visiting that country increased during the past year instead of dimunshing. Altogether, some 9,000 automobile tourists centered switzerland, the average stay being calculated at 13 days, and 11 is estimated that their exponditures approximated \$3,000,000, which is an increase of nearly 33 per cent over the expenditures for the previous year.

Effect of London Taxicab Strike.—Although the striking drivers of London taxeabs, who but recently have returned to work, had all their demands acceded to, it probably will be a long time before the industry returns to its previous stable basis. During the time the easier not running, the publish became more cognizant of the real value of London's oxedlent time and 'bus service; the result is that there is evident the station to pay the beaver toll of the taxical men and no memospherable number of the metropolis's 8,000-odd cabs are running fraceloes.

Novel Corner-lighting Scheme.—One regeneous metorist with a penchant for trakering has evolved a novel and simple apparatus for easting the light beams from his bead lamps around a corner. The apparatus consists of nothing norse complicated than two strips of height tin vertically supported in front of the lamps in matter saviveling brackets. The front cands of the strips are connected and from the connection a wire-leads to the steering column. Hence, it is a sumple matter to true the tin strips either one way or the other, depending upon the direction of the road; and as the strips normally are in the same plane as the light beams they do not reduce the efficiency of the lamps appreciably

Where Standardination is Needed.—With the present method of diving speed-whetening instruments, the indicating needle shows a tendency to assultate so rapidly as to make accurate reading difficult when the ear a driven at speed over other than very emonth reads, and this feature suggests that a better method of driving them is possible. When the matrament is driven from one of the front whosts, as it the present general practice, the bouning of the whost, with consequent sight; symming, is reflected mutantly in the meter. At least one munique, is the successible of the standard of the standard of affixing the driving gear to the propeller shaft, and has action points out wherein a material improvement in mounting and driving can be made. Such a location requires a lose facilities that that does the front wheel driving method and the shaft itself is less liable to be broken through acodesia.

## The Arches of Mexico

## Relics of Early Spanish Engineering

By Mary Worrall Hudson

I'll will be a sorry day for Mexico when the arches that were ball by the Spanish conquestadors, their descendants, and their Indian slaves, are destroyed or permitted to fall into decay.

Now all over the country, the traveler whose eye is attitued to beauty is dollarled with the springling arch, the true teauty line of architecture. The arch in Mexico is often moselve rather than light—even countersome, periaps; but it is a wiway spraceful. Many of them make up in missoury what they lack in selentific proportion and construction, like the

and Roman arches but by this means then may soon for the centuries, and will be a grateful relief to the landscape for as man more if they are pountfied to endure so long. There are articles in Mexico that rea is true as architectural principles could make them, and anot are leng built in many parts of the Republic, but R be for the preservation of the old and the pletture-sine that a plea should be succeeded in once. The old arched beings with a rade buttress propular cach pler, are among the most interesting rules of rural made but respectively and the succeeded by the preservation of the old arched being read part of the old amounty in Mexico. The builtresses were almost havingfully covered with pulsarie, as indeed by a great part of the old amounty in Mexico, but under of the Internation in the old between the succeeded together with a good cement, as in the old being at teamphore. In the linaritation may be observed u peculiarity of much of the excellent old Spanish measures. With the connect was were lifetime to the old measures which the connect was were fitten thick layers a speckled on these rather thick layers a speckled of

In the magnificent aqueduct at Quertaro u series of bountful arches stretches across the valley for a sulle and a built, activities the valley for a sulle and a built, certifying to the town the pure water that his whiding bod has guided from the mointains three or form ulbes away, it will be observed that the corners of the built bui

In the pleare of the appointer that formerly led from the syrlings at Chapultopes to the city of Mocko, it will be noticed that there is a continuous base or foundation running from are to urely, thus tyling the structure together at the bottom as well as the top of modification running from are to urely, thus tyling the structure together at the bottom as well as the top. These arches are large enough for ordibarry vehicles to pass through but the base of solid massoury, about two feet thick above the surface of the ground, presented that and thus hindered traffic to such an extent that modern Mexico decreed the full of the pletures me old aqueduct. A few small groups of arches above remain, but there is not as much left of the commarkiest modern aque better the former them. In of the capital of Mexico as there is of the author to you Caudia at Home. The destination is a distinct loss to

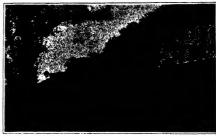
The continuous foundation that is seen in the aquiodic fit Mexico city may be seen in the construction of the aquiodict at Quiereture, where the connectial issue is much deeper and on pertions of which there is also a water contain. In certain parts of Mexico the masson's

in certain parts of Mexico the massairs is composed of large and small, or rather thick and thin, stones laid alternately, and the spring or curve of the

arch is made without wedge-shaping the large atones, by putting three layers of thin stones between the large ones at the top of the curve and two layers of thin stones between the thick ones on the under side of the

#### Artificial Pearls

 $T^{\rm HE}$  industry of manufacturing artificial pearls has developed enormously of late years, both in extent, and in the remarkable degree of perfection which these



Aqueduct leading from the springs of Chapultepec to the city of Mexico.



Old arch of the original bridge at Acambaro



Aqueduct at Queretaro, arches 80 feet high.



Beautiful arches of the aqueduct stretching acress the valley at Queretaro.

simulacra of the natural gem have attained, some at them almost defying detection save under the class accutiny of the keenest experts.

Hence an account of the methods employed in their making as described in Les Anneles is exceedingly in

The simplest forms are uniformly apherical and assumerely giass balls blown by means of tweet of varying size. More ingenious and more natural-looking are the irregular perits or peries poirregues. To produce these

the workman sometimes merely touches the ball momentarily with the end of a red-set tube, thus melting the glass at the point of contact and drawing it out irregularly. In other cases he touches one spot or another of the ball to a fizme, at the same time blowing gently in he tube.

The ball is pierced by two holes, one of which is caused by the treath of the workman, and the other by the hollow in the tube at the moment when this is detached from the pearl by means of a slight

These balls are then merely costed inside with a preparation known as "essence of the Ortent." This, despite its claborate title, consists merely of pure water holding in solution the scales of the little fish known as the bleak-fish.

Artificial pearts were unknown till 1656, when a French jeweice named Jaquia, who was fond of angling, noticed that clear water which had been need to wash bleak-fash ("Opprisus allowresse) contained a sticky deposit consisting of the beautiful shining scales of this little fash.

The first efforts to use this in simulating pearls consided in conting little balls of plaster or similar composition with it. But the conting quickly wore off, giving the "pearls" a overy aspect. Attempts to make hollow beads and apply the conting to the interior were more successful as to beauty and permanence.

beauty and permanence.
The operation consists in the sucking
of the liquid into a tube drawn out to a
fine point and then blowing it into the
glass bead, which is then given a rotary
motion to surend the coaling sevent

motion to spread the costing evenly.

The bests when costed are placed in a sieve whose bottom is covered with parchment and shaken incressantly till dry. Finally they are filled with wax so

as to be less fragile and a little heavier.
To produce beads of ultra-flue quality
and remarkable sheen, skilled workmen introduce traces of an exceedingly fusible
and volatilizable metallic alloy.

The glass employed is of a specific composition, specially manufactured for the purpose in the form of long tubes or rods.

## Lanthanium and Bacteria

SALTS of lanthautum appear to have a special action upon microbe life such as sea not observed with other rare earth as se not observed with other rare earth metals. For instance, when clusters of the microbe B, swittle is made on this surface of a liquid medium, it develops and forms a flium whether presented to the Nocetic de Blotogra, A, presented the property of flin forestion of unitary when weak solutions of different antique medium, except for suite for suitary en delange containing 1/1,000th part of suiphate of the metal, its company of the metal, its contained the nocetic de language of the Nocetic de Noc

# Battleship Drill Indoors

How New York Trains Her Naval Militia

The property of the second periodic of the New York Tayle Stiffle to read the second section of the New York Tayle Stiffle to read the second many in Sect evolutions and in the Section of the Bond" at sec. Four indistruct they can maneuver on the arr at they can maneuver on the armory or in the same way that a fivet does sea. By outting the hulls off at the ster lies and mounting them on wheels sated isside the ship, a striking resite-t affect is produced. The ships are sered by men seated so that their heads manufact the formand flow counted man under the ferward fire coutrol masts. ut are concealed by the bridge and by eather cloths through which peep holes are cut. The motive power is supplied by two men under the super-structure working hand levers connected by gear-ing to the forward wheels. Tiller ropes ing to the forward wheels. Ther ropes run from the steering wheel to an axie aft which carries a loose wheel on either and and swings freely on a vertical shaft so that when the helm is put over, the stern swings to starboard or to port.

The ships are equipped with running lights, searchlight, truck lights and Ardols stem, all connected to storage batteries and with all lights extinguished in th armory, night practice can be carried out. The various conditions of ships meeting at sea, both by day and by night, can be exactly reproduced and the proper procedure explained in detail to a large class seated in the galleries. The evolutions of a division of ships are carried out by the same signals as at see and the ships form column, line, echelon, turn and countermarch with the greatest facility, and af-ford invaluable practice preliminary to the annual summer cruises.

As the models are complete in their equipment, they are also useful in teaching recruits the nomenclature of a bat-

Apart from its value as assisting in the instruction of the Naval Militia, the fihas proved of great interest to the general At a recent review of the org zation, about five thousand people for the first time saw how a fleet of battleships is maneuvered in cruising and battle formations and a very realistic exhibition was also given of a night blockade, one vessel lighting up a harbor entrance with its searchlight, while the others crulsed around on circular blockade with all

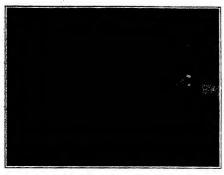
The ships were constructed under the direction of Commander Kingsley L. Martin by the Chief Gunner's Mate of the Battalion, William H. Free, and his assistants at the armory, foot of Fifty-second Street, Brooklyn, N. Y.

## News of the Coming Road Congress

I own to accomming Road Congress
I own or systematise the purchase of
I road equipment and materials will be explained in a paper to be read by
Henry G. Shirley, chief engineer of the
Maryland Sixte Boads Commission, at
the American Road Congress, which will
be in season during the welds of September 20th, at Detroit, Michigan. This pabe an essenti during the wesse to spetember 20th, at Detroit, Mchingan. This paper deals with one of the many important subjects to be treated by experienced engineers, public officials and road contractors at the big meeting. The Marytand Commission has been working out the problems of good road administration in a most painstaking and thorough manner and Mr. Bisteries paper with undoubbedly present some interesting conclusions.

Col. E. A. Bisteries. Sixto Elightway Commissioner of New Jersey, will have a paper at the Congress on the treatment which he hast found most effective for word out of revivaled inschedens surfaces. New Jissey with the Paper at the Estate and plant for road consistentials.

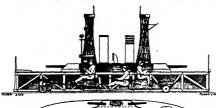
New Jissey with the fact filtre to adopt the State and plant for road consistentials and possessed to the State and plant for road consistentials.

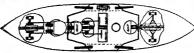


Completing a miniature battleship for maneuvering exhibitions.

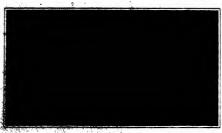


The evolutions of a division of battleships are carried out the same as at sea.





structive plans of practice battleship for naval militiamen



and of model buttleships that can be made to turn and counter-

"The Merit System in Road Adminis-ation," will form the subject of an address by President John A Melihenny of the United States Civil Service Commission, and will undoubtedly stiract nation-wide altention. Political favoritism, incompetence and indifference characterize the administration of our public roads so generally as to cause a loss estimated by some experts as high as \$40,000,000 a Mr McIthenny's paper will show the demoralizing effect of political dom ination in road management and point the way to an efficient system which will ean skilled supervision, continuous and practical service and due economy.

#### Hardening Fats by Catalysis

IN many industries, such as the making of soap and stearin, and the manufacture of various edible fats, the firm hard fats are more prized than those which are soft, lardy, or olly Hence a means of bardening the latter has long been sought

After many failures success has been recently achieved, so that it is possible to change the soft and liquid fats or oils into hard fats with a correspondingly high melting point.

In principle this consists in the intro-duction of hydrogen into the fluid fatty ucids contained in the soft fats and olis This depositing of hydrogen takes place.

according to the Technische Rundschau when the fats are warmed in the presence of the se-called contact-bodies. Nickel Nickel and pailadium are especially valuable as such cutalyzers, either in the pure puiverized state, or in the form of aqueous solu-tion of various salis of these two metals

The fat to be solidified is warmed with about one fifth per cent of the metal powder or the solution, the temperature varying between 100 deg Cent and 300 deg Cent, for different futs and different Then bydrogen is led in at the highest temperature required, and when ssary the reaction is hastened by in-sing the pressure 2 to 3 atmospheres

This process is long past the laboratory stage and has been applied in various industries on the large scale, and has been found economical as well as useful.

An advantageous feature is the destruction both of coloring matters and of mal odorous substances in the fair treated, so that a long series of previously inevitable purification processes is avoided.

This method will doubtless soon cause revolution in the industries involved, and will incidentally extend the market

#### A Case of Latent Life

A REMARKABLE case of animal leth-argy or latent life is found by M. Issel among the small crustaceans (Harpacticus fulous) of sea ponds. The water of these pools, which lie near the shore, undergoes great variations in amount of sait, being diluted after min and concentrated in dry periods so much as to deposit sait on the bottom. During high tides, when the pools are filled with a fresh supply of sea water, the crustaceans are very active and cover long distances by swim-ning, but when the sait solution becomes concentrated, their movements are grad ually slower, and finally they remain on the bottom apparently dead. But this is in fact only in appearance, for when he transported the inert animals to a less concentrated water as ordinary sea water. they revived in a few minutes and began to swim actively. M Issel calls this unal phenomenon osmotic lethargy, to distinguish it from the lethergy produced by desicention or cold. As to how long such latent life would be maintained, he collected inert specimens and placed several of them in sea water each day to ravive them, and found that after 17 days

# The Reflector—The Telescope of the Future

## Why the Large Refractor Must Give Way to Mirrors

By Edward Arthur Fath, Director of the Smith Observatory, Beloit, Wisconsin

THE rôle of prophet is by no means an easy one, and many a prophecy falls of fulfillment because of the totroduction, at a later time, of previously miknown inctors. In spite of this difficulty, however, I shall attempt, at the request of the Editor, to tell why I believe the reflecting telescope will be pre eminently the escope of the future

In the beginning it may not be out of place to recall ssential difference between refractor and reflector. The former is the one usually called to mind when we think of a telescope It has a lens at the upper of a tube through which the light passes. At the lower end is the exeplere through which we look. On the other hand, the reflector has no lens, but a large concave mirror which takes the place of the lens mirror is placed at the lower end of the labe, the latter being open at the upper end. The light passes down through the tube to the mirror, is reflected back to the upper end and brought to a focus where the eyere or photographic plate is placed

There are four points to be considered in planning for a telescope. Original cost, maintenance, efficiency and adaptability to various classes of work. Let us compare the two types of telescope under these heads. Original Cost.

Under this division we shall consider two telescope of three feet aperture The Clarks re-

ceived \$50,000 for the 36-Inch lens of the Lick Observatory and a mounting similar to that would cost about an equal amount. Thus this large refractor may be considered to represent an estment of approximately \$100,000

Now compare this cost with that of a reliector of the same aperture. It is possible to obtain a 3-foot mirror for about \$5,000. A sultable mounting can be had for about \$15,000, or even less if a very simple design is chosen equipped reflector would therefore cost in the neighborhood of \$20,000, or approximately one fifth that of a re-fractor of the same size.

For telescopes of this aperture, which must be permanently mounted and properly protected from the weather, on additional item must be considered, namely, the cost of build ing and dome. The reflector can be made much shorler than the refractor so that a dome with a diameter of 40 feet is ample for a 3-foot instrument of this type, while the great Lick re

eter of 75 feet. Since the cost of domes varies approxi-uately as the cube of the diameter, the refractor dome would cost over six times as much as a similar struc-ture for an instrument of the other type

It may therefore be said that, in general, the properly housed refractor of large size will cost at least and possibly six. times as much as a reflector of the same aperture. For smaller instruments the ratio may be even higher.

Maintenance.
Barring an occasional dusting of the front lens surface and possibly the work of washing it once or twice a year, the refractor requires little care. The reflector however needs occusional renewing of the silver flux. The frequency with which this is necessary depends mon the location of the instrument and the care with which it is protected. If the writer has been correctly informed it is necessary for a certain large reflector to be reslivered about once a month the large amount of smoke and combustion products in the atmosphere near its location. At the other extreme probably stands the Crossley reflector of the Lick Observatory The silver tilm on the mirror with which Keeter obtained his famous photographs of the nebulo, was over five years old. Under ordinary condi-tions we may say that resilvering about twice a year is all that is required for a telescope in regular use The slivering process is by no means difficult and taken but a comparatively short lime. Thus the 60-inc mirror of Mount Wilson can be taken from the tele Thus the 60-inch scope tube, restivered, and uprin be out into position in a day. Smaller mirrors can be altended to in much

Ordinary changes of lemperature have but negligible effects on the performance of lenses, while mirrors are very susceptible to them. It is therefore necessary for the most reflued work with large mirrors to have some arrangement for keeping them somewhere near the night lemperature. A small refrigerating plant is used nt the southern station of the Idek Observatory at Santiago, Chili, while an insulating cover of woolen blankets is provided for the 60-inch mirror on Mount

Efficiency.
It is probable that from the standpoint of visual observation a good refractor will give somewhat bett definition than a reflector of the same size. best of the writer's knowledge no really definite tests to determine the precise difference between the two types have ever been carried out, but the few trials actually made give the refractor the better of the argument. In theory there should be but little differ-

Visual observations, however, are by no m important, relatively, as they were 25 years ago. At that time practically all observations were visual, but now I believe it is not far from the truth to say that faily three fourths of all modern astronomical observailons are photographic. At the Mount Wilson Observatory not one per cent of the observations are visual,

There is no question whatever that the reflector is far beiter photographic instrument than the refractor;

Diagram showing relative size of structures required to house two telescopes of the same aperture, but of different types.

for it brings all the rays of light of whatever color to focus, while the lens of the refractor do it therefore seems only reasonable to use the instrunt lest adapted to modern conditions.

This freedom of the reflector from sunrious color effects is also of value in visual observations, particularly in the sindy of the colors of the siars and in work on the planets. It is so marked that a voteran observer, who has used the two largest refractors in the world and also the largest reflector in operation. recently told the writer that for work on the planets

he would without hesitation choose the reflector.

There is another point, however, which must be con sidered under the heading of efficiency. Telescopes are ever increasing in size. In order to have a lens or mirror perform well it must be supported in such a way that the flexure due to its own weight does not injuriously deform the optical surface. A lens must be supported from the edge. There comes a time when an increase in size will add sufficient extra weight to produce appreciable deformation and thereby injure the performance of the telescope Certain tests made the 40-inch lens of the Yerkes Observatory lead to the conclusion that it would not be advisable to to the conclusion that it would not be averaged in make a refractor of larger size unless a new way of supporting great lenses is found. With a mirror, nower, it is possible to have the glass of sufficient thickness to be fairly rigid and then have a system of supports so designed as to support the entire back of the mirror and thus completely prevent flexure. Furthermore, the larger a lens the thicker the glass.

This means increased loss of light due to absorption. That this is really a serious matter will be realized when it is known that the great Lake and Yerkes lenses transmit only about 50 per cent of the photographic

This is termed the chromatic abstration of the lens.

rays falling on them. This loss is due primarily to absorption. Doubling the size of such a lens would about double its thickness and it would therefore transmit only about 25 per cent of the actinic rays. This means that while the lens area has been increased four times the amount of light reaching the image would only be doubled. Now the silver film of mirror in good condition reflects about 60 per cent of the photographic rays. Therefore by doubling the ape ture of a mirror, the light reflected is increased in the same ratio as the area or four-fold. for large instruments, the reflector is the more efficient in its light-grasp.

Adaptability

A refractor is not well adapted to most kinds of direct photographic work. It can, however, be used for both visual and spectrographic observations. On the other hand, the reflector is well adapted to visual work and is at its best in spectrographic and direct photographic applications. It is therefore the more universal instrument.

Thus far the point of view has been that of the working observatory. Let us now take the amateur into consideration. The average individual of this class is not blessed with a superabundance of this world's goods and he therefore usually buys the optical parts of a telescope and makes the

mounting himself. Suppose such a person wints a telescope and must ch between refractor and reflector. What shall be do? If he will experin little until he is not afraid to do his own silvering the writer believes he will feel much better satisfied with a reflector of from 9 to 12 inches aper-ture than with a 4 or 6-inch refractor costing about the same amount. The jects us well us their true colors, and for surfaces such as nebulae the image will be brighter for the same magnifi-

However, the great consideration in this connection is the following. Very few people possess the personner mathe cal training and mechanical skill required to make refractors for themselves, but many can, with the exercise of sufficient care, make very creditable reflectors. Thus, by means of their own handiwork, they may penetrate into the depths of space and see for themselves the wonders of the heavens. There has been so much published in

recent years on the making of reflecting telescopes that almost unyone, of average intelligence and suffi-

cent patience, can achieve this result.

A friend of the writer's recently completed a very satisfactory reflector of 8 inches aperture. The total cost, including a simple mounting, was \$6. The small flat had been given to him, but even if he had been obliged to buy it, the cost would have been but \$10 more. in the foregoing I have stated some of the more important reasons why I believe that, in general, the telescope of the future will be the reflector. ons may be summed up as follows: The first cost of the reflector is relatively low, and, while it requires a little more care tion its more aristocratic brother, yet this is a small item as compared with its greater

The Compressed-air Transmission Responsa.-Despite the rebuffs to which the compressed-air transmission has been subjected, two Frenchmen, convinced of its value, have brought out a car in which six is made the medium through which the power of the engine is transmission. mitted to the driving wheels. According to the system, the engine has four cylinders, set in a V, two of which act as pumps to compress the sir in a tank hung to the chassis. From the tank, the air is admitted to two other working cylinders direct connected to the rear axic of the car. In operation, the system works on the same general principle as do hydraulic transmissions, with the important difference, of course, that the air is a great deal n ant difference, of course, that the sit is a great deal more cleated than it she old in other yeatems; hence great dealms are made for the air system. At present it is being touted out, and though its efficiency, he not been demonstrated to be very high, it is expected that its simplicity and flast-bility will overcome the disadvantage of its insificiency. Enough air is stored to make the vehicle self starting.

## Correspondence

Tips editors are not responsible for statements in the correspondence column. Anonymous or periodical actions counted to considered, but the names arrespondents will be withheld when an desired.]

#### Natural Toothbrush

To the Editor of the Scinwart American: Apropos of the paragraph on "Natural Tooth brushes" in your issue of June 7th, it may be of interes prusses in your issue of June 7th, it may be of interest to state that these are need by many of the people of our Southern States, chiefly in the rural districts. The graph of the black gum are those most in favor, while strips of thelk helouy, back are also used in the same wags or the bases guin are those most in a twor, while rips of thick hickory back are also used in the same anner. Users of snuff chew the end of the twig until nessumes a brush-like form, and then dip it into snuff, is then rubbed on the gums and carried in the mouth. have observed this frequently in Arkansas, and the gradies no doubt prevails in other parts of the South. Washington, D. C. PAUL R. BIRGE.

#### How the Public is Affected by Price Maintenance

To the Editor of the SCIENTIFIC AMERICAN

Two years ago the manager of a chain of Southern stores said to us: "We can easily sell Hoosier cabinets to our trade for \$10 more than the price you fix, and to our trace for ato more than the price you ha, and all we ask is that you keep your price list out of our territory. The Hoosier name is well known, and the cabinet is a much better cabinet than people can be a supple to the cabinet is a much better cabinet than people can be a supple to the cabinet is a much better cabinet than people can be a supple to the cabinet is a much better cabinet than people can be a supple to the cabinet is a much better cabinet than people can be a supple to the cabinet is a much better cabinet than people can be a supple to the cabinet is a much better cabinet than people can be a supple to the cabinet is a much better cabinet than people can be a supple to the cabinet is a much better cabinet than people can be a supple to the cabinet than people can be a anywhere else for the same money, so why shouldn't we be allowed to make the extra profit we can get

for it?"

When we refused to allow that dealer to fix his own price on Hoosier cabinets, he took up an unadvertised line of cabinets and is selling them for the exorbitant profit he wanted to make on the Hoosier. Our policy has been to limit the price of Hoosier cabinets to a small, fair profit, and to require our agents

cabinets to a small, fair profit, and to require our agents to stick to that strictly As a result, Hoosier agents know that they can rely upon this small profit on every cabinet, and they push the cabinets with confidence and success. They have made more profit on these ets than on a great many other lines of furniture eabinets than on a great many other lines of furniture on which the price fluctuates. The result has been an increase in volume of sales, which has lowered our cost of production and enabled us to put constantly more value into the cabinet. We have had a constant fight to keep dealers from pirating the good will our national advertising has built up, by getting hold of one or two Hoosier cabinets and offering them at a out

one or two Hoosier cabinate and offering them at a cut price, and then switching the prospect to some other makes of cabinet on which there was a long profit. Under the previous interpretation of the law we were able to stop this practice by Hmiting the sale of Hoosier cabinets to exclusive sgencies and strictly requ-lating the price at which the cabinet could be sold. With this restriction taken away, there is now nothing to prevent a dealer from offering Hoosier cabinets at a ridiculous price in order to draw trade from his competitor. He will not sell many cabinets at this public he will make it impossible for the competitor but he will make it impossible for the competitor to push Hooster cabinets at the legitimate price, and the tendency will be to throw kitchen cabinets into the class of "disorganized merchandise" that has been responsible for the chaotic condition of general furni-ture business in the past.

THE HOOSIES MANUFACTURING COMPANY, New Castle, Ind. E. G. McQuinn, Sales Manager.

#### Price Protection and the Consumer

To the Editor of the SCIENTIFIC AMERICAN:
Price maintenance is a highly important question
and one that will have to do very largely with
the economical purchasing power of a dollar in the near future.

We do not believe in a monopoly or in a we so not seases in a monopoly or in agree-monts regarding the fixing of prices by competitive manufacturers, but we'do believe that the con-sumer is more thoroughly protected when he pur-chases an article upon which the manufacturer has fixed a selling price than he is in the purchasing of an article that has not been standardised in

Our reason for making this statement is: First. Our reason for making this statement is: First. Because the nanufacturer cannot afford to establish a price that is too high or excellent received. Second. If he is assured that the acticle which he is manufacturing is to be restailed at a certain price, he is enabled to plan his product and distribution in the most economisal manurer, thereby tribution in the most connumbed manner, thereby giving the consumer full value for money expended. Third. Retailiers generally profer to handle standard: priord exticles, and they will tell you almost without exception that while they do not make at large a grount on these proofs as they do, as a large a grount on these proofs as they do, as a rules on ground which are not standardised, as accepted of the critically better material for the critical of the critical property.

作業を必要性は特別を行う。 マー・ファイン

given to their customers they find them more

given to their customers they find them more profitable to handle. Personally, I much prefer to go into a store and buy an article which is sold at an established price to everyone. As a manufacturer I feet that we would be unable to maintain the high quality of our product were it not for the fact that we wish. insist on prices being maintained at a certain andard. South Bend Watch Company, South Bend, Ind. S. D. Rider, Vice-President.

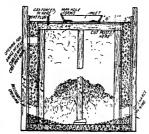
#### Practical Elimination of the House Fly

To the Editor of the SCIENTIFIC AMERICAN:

The case against the house fly has been so thoroughly and well handled that no further arguthoroughly and well handled that no further argument as to the desirability of eliminating this peat is necessary. The oriminal has been condemned to death. These undesirables, however, are so numerous as compared with the executioners that no impression can be made by this means of procedure. A great deal has been written on the subject, well meaning idealists have expounded their theories for years on the lecture platform, but so far the writer has been unable to find even the suggestion of any practical method which will tend to dimnish this pest. Therefore, let us get at the cause and see if it is not possible to destroy this insect before she can lay her eggs.

at the cause and see if it is not possible to destroy this insect before she can lay be reggs.

Every student of the subject knows full and thoroughly well that the house fly is hatched in stable manure; one fly will lay 150 eggs a day, the progeny of one fly during a sesson could multiply to the enormous figure of one hundred and ninety-five billion. If we attempt to destroy the larve, or the eggs, by means of saids or lime, we also destroy one of the most valuable



anure pit designed to facilitate the killing of files.

products of the farm. Lime will reiesse the ammonia in the manure and thus destroy to a great extent its fertilizing value. The same occurs when various acids are applied. So our problem is to preserve the fertilizing value of the manure and at the same time destroy the fly before she has

as the eggs batch, the larves work upward.
They never work downward. The habit of this
Insect can be well noted by observing any fly
trap. The bottom of the trap is always open. the fly's instinct is to work upward, it no

finds the opening.
Some philosopher has said that a problem well and thoroughly stated is half solved. I

Some philosopher has said that a problom once well and thoroughly stated is half solved. I have briefly stated the problem, and keeping in mind the institute of the insect, a solution for the elimination of the fly presents itself, and in presenting itself we also find a means of better preserving the fertilizing value of the manure. Up to the present time, this value has been conserved by the use of concrete manure pitc, thus retaining the liquids and therefore the nitrogen. Carry this idea a step farther and build a concrete stank with a covered top. The tank should be elevated in the top of the tank, we such below the present time top of the tank, a venthole consisting of \$5\time\$-inch or \$5\time\$-inch or \$\time\$ client he po, or a trap door in the side at the top, and two or more disabeter opening the control of the manure placed in the tank. The cover is immediately replaced over the manhole, and before the next two placed in the tank. The cover is immediately replaced over the manhole, and before the next bette is placed in the tank. The cover is immediately replaced over the manhole, and before the next bette is placed in the tank. The cover is immediately replaced over the manhole, and before the next bette is placed in the tank. The cover is immediately replaced over the manhole, and before the next bette is placed by the tank. The cover is immediately replaced to the tank. The cover is interested to the tank and the cover is the cover is the tank and the cover is the cover is the cover in the side of the tank and the cover is the cover is t

By this method, between the time each batch

is placed, the flies that are listaked are killed The larve hatch in a few hours, always work upward, and become pupe in about five days The discharge opening being at the bottom does not form an outlet for the fly, the liquids are all retained and the manure can easily be removed by long handled rakes or hoss, or if the tank is sufficiently large, a chann conveyor can be operated running across the bottom of the tank, pulling out the contents, which of course by gravity is stomatically replaced.

A circular tank 15 feet in diameter and 10 feet

high will hold about 60 tons of manue. Such a tank placed alongside the stable, at a level lower than the stable floor, serves the double purpose of conserving the fertilizing value of the manure of conserving the fertinging value of and killing the fly before she can lay an egg. The and killing the fly before ane can my an egg row size of the tank depends on the number of head of stock. On a large stock farm, such a tank of above dimensions would cost about \$80 and of above dimensions would cose and would more than pay for itself in one year.

ALBERT MOYER

#### How the Retailer and the Public Benefit by Price Maintenance

To the Editor of the SCIENTIFIC AMERICAN:

As a manufacturer who believes that his duty lies in serving the public, I wish to express my appreciation and approval of the stand which you have taken in regard to the right of the manufacturer to establish the price at which his product shall be sold to the con-

The popular conception of this matter, as held by the general public, is so erroneous and se inuical to their best interests, that I cannot conserve of any work which can be of more importance and of more service to the public as a whole than that of presenting clearly and concisely the true facts of the matter.

The main object of all unnufacturers is to place a price on their product which will enable the largest possible number of people to buy and use it and at the same time yield to themselves and to those who distribute their product an adequate and reasonable profit.

As volume of business is the thing most desired by

As volume of reasmess is the thing most desired by the manufacturer, and as he realizes that the volume must depend absolutely on the reasonableness of his price, the possibility of his setting a price which will be unreasonably high or yield himself or his dealers an everhilant profit is extremely small.

As a matter of fact, out of the several hundred trademarked articles on which has effort has been made to maintain the price by the manufacturer, I know of

no instance in which the price has not been lower than it would have been if the establishing of the retail price had been left to the unrestrained action of the retailer.

The main object of the retailer is to secure volume

and profit, just as these are the main objects of the seturer, but the retail dealer's ideas of the proper way to seeme volume and profit are very different from those of the manufacturer.

The average retailer believes in securing an abnormally large profit on the greater part of the merchandise which he sells, and trusts to seeming his volume by offering an abnormally low price from time to time on certain articles, which he believes will bring the people to his place of business.

ems to me that it is eminently unfair that certain people have to pay a very excessive margin to obtain certain merchandise that other people are able to obtain at practically cost as a result of this merchan-

With the right to establish re-sale prices once granted to the manufacturer, the abnormally high price and the abnormally low price are both eliminated from the scheme of retail distribution.

The relatiler, instead of securing 40 per cent, 50 per cent or 60 per cent gross on his retail price, as it is his desire to do on the majority of goods which he sells, must content himself with the normal 25 per cent or 331's per cent which the prices established by the manueturer yield him. Neither is it possible for him to cut the price on

this product to a point where there is no profit in it for him, where he undernmes the business of his competitor simply for the purpose of getting people into his store with the ridiculously low-priced article as a balt in order that they may purchase increased quanti-ties of the exorbitantly priced articles.

The educational work which you are doing will, I think, help to prove to the public that the greatest element in the high cost of living to-day is the excessive cost and profit of retail distribution caused by too fierce competition on the part of the retailer and a desire for too heavy a profit on his part, and that the only curb to this excessive cost of distribution has in giving the manufacturer the right to establish a reasonable price at which his product shall be sold NATIONAL VENEER PRODUCTS COMPANY,

CHARLES R. STEVENSON, General Manager. Mishawaka, Ind.







A pair of French military carrier pigeous.

T might be imagined that the present era of the eroplane and the wireless telegraph has no use for the swift and fulthful winged messengers which rendered such valuable service in the Franco-German and other wars. Many persons, indeed, are convinced

and other wars many persons, indeed, are convinced that carrier pigeons now serve only for the amusement of a few old fogy sportamen. These views are quite erroneous. The attention devoted to carrier pigeons by the governments of Europe, and especially by that of France, show that the ser not been forgotten, and that at least as

great a reliance is yet placed upon th as upon the mysterious and erratic Hertz-

At present France maintains twentyeight military pigeon houses, distributed among the fortifications, especially along the eastern frontier. These establish-ments, which are in charge of the en-gineer corps, are devoted to breeding and

training carrier pigeons
I have succeeded in obtaining special permission to visit the military pigeon houses of Vaugirard, near the fortifications of Peris, where the system of breed

the solution was explained to me by the commanding officer. The reader will be surprised to learn how much care is lavished upon the birds. The soldiers love the pretty little creatures, and follow their

educational progress with keen interest.

At Vaugirard, as elsewhere, the piges placed on the roof of a building, and each is divided into two compartments by an alley. The floor is com posed of plaster, covered with a layer of dry and moderately the sand, which protects the feet of the birds from fecal deflement. The water ressels are made small in order to minimize the quantity of water which the birds scatter in bothing, but whenever it is possible

to have a supply of running water on the roof of the pigeon house commedious busins are there installed, in which the birds can bathe freely and thus rid them selves of vermin

In all cases abundant ventilation is pro-vided, about 35 cubic feet of space being usually allotted to each pair of adult pig eons and 9 cubic feet to each young bird In order to facilitate the circulation of air, the roof of the pigeon house is never plastered, except in mountainous or other

The orientation of the house is a mat ter of importance. Nearly all of the French pigeon houses face approximately north-northeast, or in a direction opposite to most rainstorms. The administration takes care not to place pigeon houses near telegraph or telephone lines, which might injure blrds, stilking them in flight. Large trees and high buildings are also objectionable because they afford convenient perches for pigeons willing to shirk their flying exercises. The enges are inclosed in glass sashes in order to keep out rodents, and neighboring chimneys are covered with wire netting to prevent young pigeous from falling into them. All of the military pigeon houses are connected by telephone with the offices of the ngineer corps.

As a ruie, each pigeon house contains

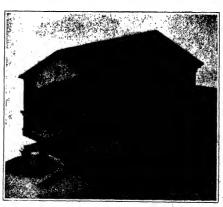
100 pigeons ready for mobilization. To maintain this effective force requires one or two compartments of 130 adult pigeons, a compartment of 200 young birds of the year, two detention pens (one for each sex), which are used only at a certain season, an infirmary facing the south, and a inboratory for the reproduction of

The denizens of a pigeon house are selected from lirds four or five weeks old, which have not hitherto left their natal house. They are first subjected to four or five days' observation in order to ascertain that they



The basket in which the pigeons are carri

are sound and to supervise their feeding. They are then encouraged to emerge from the house and fly s allowing them to escape voluntarily, without frighten ing them, so that they will recognize the entrance door. This is done about 3 P. M. daily. If the birds were driven out they would probably fly far and fail to return When adult birds are added to the colony the preliminary training must be greatly prolonged. The newcomers must first be penned up for a considerable time, then mated with older residents, and finally prevented from flying during the entire season by short-ening five or six principal feathers of the left wing



Type of dovecote used by the French Army for the senitary housing of its carrier piges

by about two inches. At the mouiting season the amputated feathers are replaced by whole ones. By this time the birds have become accustomed to their new The effective or mobile corps, which in May consists of 100 pigeons from 2 to 8 years old, is in-creased in October by the addition of 6 reserve birds and 23 young birds, 18 months old, which have taken part in two training campaigns. The winter colony, usually reduced to 130 birds by inevitable losses, produces 200 young for the next season's training.

The pigeons are fed on mixed beans, peas and vetches, which have been gathered a year. The individual daily ration consists of about 1% ounces of this mixture, divided into three meals, given at dawn, noon and S P. M. The pigeons are also provided with clay old morter, fine river sand, selt and egg shells or oyster shells, ground and

mixed in equal parts. This mixture, which is called "salted earth," is left permanently in the cages.

In pairing, care must be taken not to mate two birds of very light coloring, or of very close kinship or strong resemb-lance. Pigeons differing in color of piumage or eves should be mated, and cr ould be made between large and small,

old and young, shy and tame birds. After marital conold and young, say and tame birds. After marital con-cord has been established by a few days of enforced cohabitation in seclusion, the couple is allowed the liberty of the compartment. Two eggs are laid within liberty of the compartment. Two eggs are laid within a fortnight after mating and are hatched 17 days later. When the young pigeons are three or four weeks old and have begun to feed themselves they are separated from their parents and placed in a comp has a southern exposure and receives the maximum amount of sunlight. The young birds of the second or autumn brood are not usually preserved, because they are less robust and moult abnormally. The military training of carrier pigeous begins with

exercises in flying about the pircon hou Every bird is required to fly, during an hour at least, twice daily. These trial fights are supervised with great care. When the cages have been opened, the soldiers drive out the pigeons and prevent them from perching on the roof of the pigeon house. The few birds which set a dangerous example to their fellows by alighting on neighboring roofs are shot without computation. Well-trained pigcons have a range of flight which sionally carries them out of sight. Young birds begin with flights of a few minutes. duration, which is gradually increased to one hour at the age of three months. In order to make the birds understand what is required of them, the same signals are always given for the same evolutions. The pigeons are induced to leave the cages by shouts, clapping of hands and striking the partitions of the compari-ments, and they are recalled by whistling. after the mangers have been filled and

arrer the mangers have been filled and grain has been strewn on the floor. The fiying exercises are followed by training in carrying dispatches over geo-gressively increased distances. In ones of modification the places would be transferred to schee place which must be kept in communication with the army, in the event of transfer, it would seem

where on the testation is commented with this first his trive territories to be contained from a contact that and other senses of constrained are been limitatives. This procedure, heavener, in each to be quite register, and as a role the ment of the quite register, and as a role the interpretation in the every direction around the

Tagger law place in every direction around the month layers.

The fights are not sites price in rain, spow or for. The fights are not sites price in rain, spow or for. The fights are not sites price in the constitution of the fine fights are represented by the fine price in the price in the

for a definite period.

The length of the course is increased from 20 kilometers (12½ miles) on the first day to 30 kilemeters on the third day, 50 on the sixth, 80 on the fourteenth, on the twentieth, 210 on the twenty-eath, and 300 on the thirty-fourth.

The yearling pigeons undergo nearly the same training, during six weeks. After a few preliminary releases in the After a few preiminary releases in the vicinity of the pigeon house, the young hirds attempt a flight of 10 kilometers, and the distance is gradually increased until it attains 200 kilometers at the end of the six weeks.

Practice flights are made over sea, as

well as over land, when the location of the pigeon house permits.

released early in the morning in order to avoid the heat of the day. In calm weather the normal speed of flight is 800 to 900 meters (about ½ mile) per minute, so that it is easy to calculate the time required to return to

The results of these practice flights are carefully recorded, together with losses of birds and other incidents.

As the purpose of these exercises is to train the pigeous for regular messenger service, the birds carry dispatches pre-pared specially for safe and easy transportation. The dispatches are either writ-ten or photographed. The former are writ-ten on sheets of very thin paper, measuring about 3 by 41/2 inches, which are triply folded and then rolled up, so that

triply folded and then rolled up, so that they form shender rolls about 1½ inches long, which taper slightly toward one end. The photographed dispatches are made from manuscript sheets measuring 11 by 44 inches, photographed on films measur-ing 1½ by 2 inches, which are simply rolled for transportation by the pigeous On receipt, the film is applied to a plate of glass and read with a magnifying glass

r projected on a screen by a lantern.

The practice dispatch contains a request that the capture of the pigeon be re-ported to the military authorities, and also bears the designation of the bird's home, the place, date and hour of release,

the number of birds set free, a serial number and some moteorological notes. The dispatches are carried in tubes of two sorts. One is a goose (uils 1, 4) inches long and 1/5 inch in diameter. The dis-

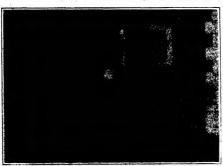
two sorts. One is a goose quill, 1/2, inches long and 1/6 inch in dismoter. The distance of the latcher esdess the pigeon with his left hard and process its breast to his own. Then he separates one of the median tail frathers and pusses it through the goose quill by compressing the borbs of the frather, which, when released, resume their normal position. The dispose that then introduced into the void which the shand of the frather leaves in the goose quill and is escured with a pointed match-click. In castless method, a take of absolution is attached to a single of the blief, and the disputable inclosed in a smaller take, it this incorrect places before certain margin by which it was sentily by incorping the properties of the pure, the comprehendance of the pure o

tich are revealed, furthermore, by a spiral band of col-ored celinicit borne on the right leg. A maie is indi-cated by 3½, a famale by 1½ spires or turns. There are seven celow: black, white, blue, red, yellow, green and violet, each of which corresponds to a different

In order to complete this brief sketch it is n to mention the material equipment employed in breed-ing and training the carrier pigeons of the French army. This includes the equipment for the transpor-tation of pigeons, in addition to the equipment of the

As the pigeons are allowed to leave the house at fixed hours only, it is necessary to place, at the entrance of each compartment, special entrance cages, which are set in the windows. These cages are so constructed

A mule laden with carrier pigeons.



Cart for transporting carrier pigeons.

that the birds can enter f vely but cannot escape. The eage is issually 28 inches high, 32 inches long and 28 inches deap. The sides are formed of from wires about 1½ inches apart, and the top is covered with a wire 114 inches agart, and the top is covered with a wire grating, having messles measuring 4 by 5 inches, an interval sufficient for extrance, but too small for exti. The upper helf of the front is like the dides, but the lower half is closed, by a morable frame of inverted U-shahed wires, which water on hinges from the top her of the frame, the betton bar of which allows the lower ends of the whist it, more inward, but not outward. The returning piacesis, slighting on the board in fract of the claim, enter by pushing these swinging wires foward, but come, but come by the same way. The morable frame is raised by a cord to release the piaces. See allegating the and is not one specuous in order to assist, young birds in finding their

way home. The breeding nests are arranged in superposed cells, each of which contains two nests, for the second clutch of eggs is often laid in less than three weeks after the first broad is hatched, and before the young birds are able to feed themselves. The top of the group of cells forms a promenade for the pigeons. The cells are closed, in front, by light wooden gratings, which are easily removed when the nests are cleaned.

The drinking fountains are of the familiar siphon type, and are composed of three-gutton bottles, sup-ported in an inverted position on iron tripods over shatlow troughs, into which their mouths dip. The house equipment comprises various appliances, which would st none except pigeon fanciers.

The pigeous are conveyed from place to place in that

rate pigeons are conveyed from piace to make in mar wicker cages. The birds are released for flight by opening a small trap door in the top of the cage. These enges are made in three sizes, which accommodate 25 to 30, 12 to t5, and 4 to 6 pigeous, respectively. The smatlest, or truining cages, are covered with muslin. The cages are transported by railway, in wagons or on mule-back,

The French military authorities encour age the breeding of carrier jugeous as far as possible. French civilians maintain numerous pigeon houses, which are under the supervision of the war ministry, and in which thousands of carrier pigeons are trained. The inhabitants of the départment du Nord, like their Belgian neighbors, are enthusiastic breeders of carrier pigeons. The training begins with the ad vent of warm weather, and atmost daily hundreds and thousands of pigcons are sent out, at first to neighboring departments, but later to the center and south of France, where they are released. The officint military recognition of the carrier officint initiary recognition of the carrier pigeon dates from the Franca German war of 1870-1871. Although the birds then employed were poorly trained, they necomplished such remarkable feats that their aid in future wars is refled on with confidence. It is probable that pigeons will soon be carried by acrophues, despite the instinctive reluctance of aviators, who regard the birds as dangerous pas sengers. The rigging of a swiftly moving aeroulane might, indeed, be seriously in jured by the impact of a pigeon, and the fouling of the propelter by a bird might be still more disastrous. For the purpose of averting these accidents at the moment of release it has been proposed to drop the pigeon, head downward, through a long vertical tube, so that the acceptane would be far away before the surprised tird could right itself and begin its flight This device will be tested by experiment during the conduct senson.

#### Coffee from Dried Figs

EVER since coffee has been a popular beverage, apparently, efforts have been made to find substitutes for it, either as mere adulterants, like chicory, or for the sake of greater wholesomeness or cheapness. Rye and other grains, lupine. acorus, beets and carrots have all been thus used, but the tig coffee, or Feigen Kuffer, which has latterly come into asc in Austria and elsewhere, is a decided novelty. Les Annales quotes M. Trabut of Algiers as saving that an excellent coffee can be made from dited and roast ed figs, which need not be of the first

They are dried in the sun or in even orating pans, according to estimate, and then rousted in ovens (11) brown or almost black and quite brittle. They are then ground up and the resultant powder is pressed

then ground up and the resumant powher is pressed tho tablets. These must be kept di. When made use of they are merely dissolved in hot weter. One hundred kilos of the dry figs give 75 kilos of the dry powder. The figs cost 15 francs and the powthe dry powder The first cost 15 frames and the powder sells for 60 frames whotesaile and 100 or more at retail, so that the trade ought to be prolitable if a demand can be created. The beverage is said to be agreeable in color and flavor with a somewhat sweeter taste than that made from chicory

### A Soft Laboratory Wax

A FAMOUS laboratory wax used us a fitter or for Auttaching light articles to glass, etc., is made as follows: Beeswax, 40 parts: Venetian turpentine, 10 parts; rosin, 1 part; color with vermition Melt the ex and rosin, add turnentine and cotor. Stir until cold

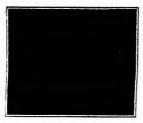
#### Curious Resemblances in Nature

#### By Harold Bastin

TO truce in matural objects a resemblance, either struc-tural or pictorial, to other ob-jects with which they have no real connection is a diverting pastime. Moreover, though at first thought It may seem some-what puerile, it can to fact be turned to good account as a means of stimulating the imaginution, and inducing the mind to embark upon a course of iruly schoolike Investigation which may lead to Important discover This applies in particular to the training of the youthful student. All those who have guined experience as teachers will readily admit the laitled dif denity which exists in arousing the intelligent interest of a class in the subject of study. In other words, something is needed to set the unchinery of the mind in motion. For example, a flower or an insect, as such, any fall to evoke the desired response. But If we can point out some curious or grotesque likeness which it bears to a familiar creature or thing, we are able from this starting point to lead on by carefully planned stages to such great questions as structure, natural affinity, and adap

Take, for instance, the case of the orchids. Several species bear popular names which suggest the likeness of the flower to some member of the unimal kingdom Thus, we have the man orchid, e orchid, the spider orchid, the lizard orchid, and the monkey orchid. It is true that some of these supposed likenesses are highly imaginative, but others are wonderfully distinct, and will bear close scrittiny. The bee orchid (Ophrys apifera), for instance, is very much like a small highly colored humble-bee, the wings, head, untenne, and hair, body being all reproduced in case of the so-called mun orelid (Accres anthropophora) the general effect of the flower is very quaint and striking, looking a series of small green pup In the very curious fly orchids (Ophrys mucifera) the likeness to an insect is not marked, although a vivid imag ination can conjure up wings, an iennæ and a protruding head, but the lower part of the flower resembles most closely a little doil, or monkey, dressed in a sleeping sult with a white sush round its waist

In all these Instances the resemblance is mainly due to the shape of the lip or bebellum of the bloom. Now orchids rank admittedly among the most high ly specialized flowers, while their extraordingry modifications are the result largely if not entirely, of insect interference. Many of those flowers depend entirely up-on the visits of insects for politic ation, and without the aid of winged emissaries Cupid they are quite unable to set seed. The labellum is the recognized allighting platform upon which the losset stands while it probes the recesses of the flower in search of nectar, and us orchids are so closely ussociated with insects, we must assume that the special shape of the labellum in each instance is more or less definitely related to the convenience of the guests that are specially catered for by



Buds of the huge tropical birthwort (Aris tolochia) resemble swans in outline if viewed from one direction.



The "old man's face" exhibited by the staminal column of Arsufia grandiflora



Flower and bud of canary creeper (Tro-pucolum) the whole much like a fan-tail pigeon in appearance.



A "drooping bud" displayed on the fore-wing of a tropical "meon" moth.



Not a collection of human skulls. Seedcapsules of the garden snap-dragon.



The skull on the thorax of the "death's



Flower of the sweet sedge (Accordanus) resembles a round file.



The wing tip of the Indian "snake" moth suggests the head of a cobra or a seal in profile.



The "80" mark on the

adapted to attract, or to a particular kind of inner

Most young people are familiar with the canary-hird flower or the common causey cre (Tropacolum canaricase), here again we find that the nuusual form of the blossom is due to insect visits. The blooms of this group of plants seem cially designed to meet the n chally designed to meet the needals, which seldom or never settle on the flower, but hover in front of it; tightly poted on their amplity-moving wings. While in this position the tongue is unrolled and thrust far back into the "spur" of the flower where the nector is stored. Meanwhile. the head or body of the moth comes into contact win the pin-til or stamens, and pollen is de-posited or removed, as the case may be. The flowers of Tro-pasolum are among the few in which nectar is secreted by the calyx, which is brightly colored and extended to form a long spur. The lower narrowed part is the nectary, and the award liquid is sometimes so abundant that it wells up to the moth. This spur, of course, forms the head and neck of the little canary bird, while the flamboyant ary bird, while the flamboyant tail is represented by two of the petals. When still a bud, the flower also presents a subdued, bird-like aspect.
An interesting re

a swan is presented by the unopened flower-buds of the huge tropical birthwort Aristolochia This and allied species may often be seen growing in hothouses, and may be compared with the species of temperate regions, such as Aristolochia tomentosa, and A. sipko—the well known "Dutchman's pipe." All these very remarkable flowers, which rival the orchids in the grotesqueness of their form, are designed to attract and imprison small Dipterons (two-winged) flies which feed by prefence upon filth and carrion— hence their foul smells and lurid colors which seem to suggest putrescence. The structure of the flower varies in different species, but the essential points are (1) an alluring area leading to (2) a throat or vestibule which, in its turn, conducts to (3) an inner chamber or prison. The swan-likeness of the flowerbud in A. pigas enables us read-ily to appreciate this description The body of the "swan" eventu ally expands to form the alluring area-an enormous expanse. alty-six inches long by eleven inches broad, the whole surface of which is covered with a net-work of blood-purple veins. work of blood-purple veins.

These converge about the entrance to the month or vestibule
(i.e., the neck of the "swan"), which is lined with inward-pointing hairs. Flies which settle up the alluring area are indu by the strong scent of the blosby the strong scent of the blos-som to enter the vestibule, which freely admits, and even facili-tates, their entrance. But if they attempt to reture, they are prevented by the hairs. Thus they are doubt to penetrate the stage are doubt or penetrate the stage of the flower

#### Clock That Speaks the These of Day By W. R. L.

A sit innocent looking phonograph sings on nograph sings out "Three dered by a bugle call, amply repays one the inexpensive attachments. The followg as made for the writer's Edison home phonograph the serve as a scheme for other models.

Two electro-magnets are necessary—one for starting and one for stopping. These are mounted as shown in Fig. 1. A is a stirrup of metal for mounting the two sagments B and C. D is a block of metal %-inci are fastened to the wire B, which is arranged to



Fig. 1.—The starting and stopping magnets.

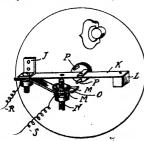
play easily back and forth through the holes in the all pieces of feit are set into amail holes in the block D to prevent it from sticking to the magin the block D to prevent it from sticking to the man-nets. The sitrup A is fastened by screws to the under surface of the phonograph top. The wire BE is left long enough to axtend to the start-naf-stop lever of the phonograph, if this lever can be so adjusted as  $t\sigma$ operate easily, otherwise the wire may be made to pass through a small hole G, Fig. 2, drilled through the govthrough a small hole of sag. a different integral and extension H of a small brase city I slipped over the end of the governor shaft. The city I is made of spring brase the governor sant. The city I is made of spring breas with adjustable friction fit so that when maguet B is energised and the wire EB pusses in the path of the clip the governor comes to rest gradually. The "let-off" mechanism, Fig. 3, is attacked to the



Fig. 2,--Starting rod acting on the governor.

back of an alarm clock by means of a bracket J. At K, Fig. 8, is light clock spring with weight L. M M are fiber washers insulating the screw contact post N from the bracket extension O. PP are brase plus set in the milled nut used to set the hands. These strike a plate un the apring of we take makes, these strees place on the apring of the place, when released, makes momentary electrical connection between wires R and S operating magnet C. The "stop mechanism" is made in the same way as the "let-off." It is fastened by means of a suitable bracket beneath the flat spring that carries the nut" and moves along with the reproducer arm as the record is being played

Electrical contact is made when the small plate ( rides up on a tooth of the rack T and drops off. Plati-

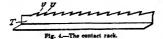


m on the back of the ci

num contact points were found necessary for the stop mechanism, as the adjustment had to be made more deficate than was necessary for the "let-off" attached

to the chock. The reads of short breas and is fustened to the bed piece of the photograph in any suttable manner. (The edge may be nitpost under the name plate) The points of the white plate in the scale of to correspond with the "direct intervals" in the scale, A. Steinby convoints will help you inseed a suttable result, (Expelient formation for making records may be find been any photograph dealers). Exceeds are easily upon, Alife that union on this styre of photograph

clock may be saried to suit the fancy of its owner. If arranged to speak the time every half hour (two pine P.P., Fig. 6, being necessary) two records should ade, one from 12 to 6 and from 6 to 12, or record speaking the hour intervals from 6 A. M. to



Short silent intervals are ne ary in order to s Short silent intervals are necessary in order to allow the phonograph to reach full speed before speaking after the "let-off" operates. (The clock and the two dry cells necessary to operate may be placed inside the record cabinet.) When wishing to play records simply remove the rack 7. By substituting a piece with one or the end the phonograph stops automatically at the end of each record.

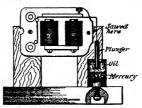
#### A Mercury Interruptor By George F. Worts

IN SO FAR as theory is concerned, interrupting the current for a spark coil for wireless use is a simple matter. In actual practice, however, contingencies arise and interruptors occasionally manifest contrary tend ich cause their application in wirele raphy to be a source of no little appoya

For instance, the text books tell us that in an electrolytic interruptor small non-conducting bubbles form and break on the anode with mechanical regularity. thereby causing an interrupted current flow. How a ple it sounds! But somehow or other the bubbles fail to form and break regularly and, taken with the rapid heating properties of an interruptor of the electrolytic type, generally cause it to be a rather unsatisfactory of apparatus.

In the case of a water cooled, platinum electrods electrolytic interruptor, the above difficulties are usually not present, but the prohibitive cost of this instrument bars it from the majority of amateur stations.

As a parallel case to the above, we find the spark



Mercury interruptor made out of an electric bell.

coil vibrator, unless of expensive make, to be generally

nsatisfactory and inefficient
A form of interruptor which has met with a great deal of approval among the advanced class of experi-menters, is the mercury independent type. Singularly mgh, this unique and efficient form of current breaker, which is employed extensively in electrical work account of its positive operation, has been neglected almost entirely by the amateur wireless experimenter, usually so prompt in adopting a new idea, provided stified in doing so

e is justified in doing so.

We will attempt in this article to acquaint the experimenter with a simple and cheap, though efficient, form of the mercury interruptor for wireless use

From an ordinary electric house bell saw off the jut-ting arm which supports the bell. Remove the round clapper from the end of the vibrator and solder a 1/6inch round brass rod about 2 inches long in its place. Bend the extended part of the vibrator at right angles insua in extenses part of the violator at right angles to its usual position and parallel to the magnets and mount the bell base to square wood standards erected to a wood or rubber base having the dimensions of % by 8 by 6 inches.

ne magnets are now actuated, the brass red will

vibrate up and down with about a \( \frac{1}{2}\)-line stroke.

A small brass cup, 1 facth deep and \( \frac{1}{2}\) facth wide, should now be procured and a hole tapied into the bottom to accommodate an 8/32 thread. A machine screw passing up through a counter-sunk hole in t screw passing up through a counter-sunk hole in the base, located directly under the brass plunger, will secure it firmly. By bending the extended portion of the armature, the plunger should be adjusted so that fix lower end it. §§ inch below the level of the top of the cap. The caps should then be filled with mercury to a level % inch below the end of the plunger. A good grade of light cylinder oil should then be poured roury until it is about level with the top of

the cup. This will quench any arc that might possibly form and, incidentally, will prevent the mercury from splashing out.

In operation, several dry cells are required to actuate the magnetic. The vibrator of the spark coll should be screwed down tight, the battery circuit switched on and the contact screw of the completed interruptor adjusted until the desired spark frequency is obtained. A little practice in this direction will accomplish the

The mercury interruptor above described requires little or no attention and is practically non-heating.

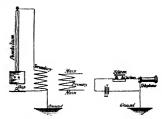
If used on the regular lighting current, either afternating or direct, a water rheostat should be provided, as the resistance of this interruptor, unlike the electrolytic, is very low and 110 volts would prove too strong for both itself and the spark coll

#### A Seconds Pendulum By C. C. Kiplinger

A SECONDS pendulum is frequently used in the physics laboratory. After an extended experience with unsatisfactory contact pendulums of the mercurial type, the following instrument was devised which has ed itself successful in practical use The details of the contrivance are shown in the sketch

A wooden rod (a meter stick does nicely) has a screw eye attached at one end. This is filed to a kuife edge, so as to form a frictionless point of support. The fixed kulfe edge is made from a small file, also brought to a sharp edge by means of a second file. Two plates of thick sheet lead and two short bolts comprise the bob of the pendulum. A short length of wire fastened to one of the plates and lying in the axis of the rod, serves for one terminal of a small spark gap. The othe terminal may be either a small metallic ball or rad with The other rounded ends

The connections should be made with a trans or induction coll and the ground, as shown in the figure A short gap should be used and the spark should be but little longer than the gap in order to moure a vertical spark With the apparatus in working order, every



onds pendulum as a wireless transmitter.

swing of the pendulum gives rise to a spark, which in turn semis out electro-magnetic disturbances into space

The instruments used for the detection of these disturbances are, a 75 ohm telephone receiver, a modified Massle's oscillaphone, and two dry cells, connected as shown in the sketch. The oscillaphone comprises two carbon knife edges insulated from each other and about 3/16 of an inch apart A piece of stiteon is laid acre solve of an inequality and precess standardons had across the edges. A piece of galeon or a light sewing needle may also be used. Under the conditions in which we work, silleon has proved far more sensitive. The allicon should be moved to and fro on the carbon supports untii the signals are loudest

Any desired number of detectors may be operated by the "master pendulum," and these may be in differ-ent rooms, or in an adjacent building. Such a pendulum will be found far superior to the ordinary type.

The Department of Terrestrial Magnetism of the Carregie Institution, the all-important center of world-wide magnetic surveys, is at last to have its own offices and laboratories in Washington, after having been domiciled in an apartment house ever since it was founded. of about seven acres has been purchased in the same suburban district of the capital which includes the Bureau of Standards and the Carnegie Geophysical Laboratory, and the new buildings are expected to be ready for occu-pancy early next year. The magnetic survey yacht pancy early next year. The magnetic survey yac "Carnege," attached to this institution, early this ye crossed the South Atlantic from the Falkland Islands. St. Helena, and then returned to the South American side. e is due in the United States at the end of the after three years of circumnavigating the globe. Dr. L. A. Bauer, director of the department, is to deliver the Halley lecture on "Terrestrial Magnetism" at the University of Oxford, May 22nd. 1914.

#### the grown

#### Inventions New and Interesting

Simple Patent Law; Patent Office News; Notes on Trademarks

#### Recent Improvements in the Reciprocating Engine Art

In is generally conceded that the reciprocating engine has reached a very high stage of development, that there can be no radical departure from the universally accepted engine construction without serious loss in

The direction of improvement, and, indeed, the proper direction, has been in working between the widest attainable limits of temperature

Meam must enter the machine at the highest possible temperature, must be protected from waste and must retain, in the moment before exhaust, the least possible amount of heat. Among the investors who have recently been working along this line is Prof. Johann Stumpf of Berlin, whose engine is of the type known as the "ind-directional flow" steam engine, In such engines, as distinguished from "counter flow" engines, the steam once admitted into the cylinder dose not return in its path. The steam is permitted to enter each end of the cylinder alternately and exhausts through a set of ports which entried the middle of the cylinder, these exhaust ports being controlled by the histon at the end of its stroke

In the fature, the steam, nested of helius introduced into the egithed effect, enters it from the holius head. At through the higher B, thus providing a live steam jacket we thank the steam is neither cooled on room the steam of the steam

A jet condensor E is placed in a box  $D^*$  of the exhaust pipe  $D^*$  in order to cool the exhaust additionally to facilitate the sweeping out of the exhaust steam

to maintain the sweeping out of the exhaust steam. This construction provides a hot inlet and a cool exhaust, and there is a gradual full in temperature from the inlet to the exhaust, the working steam at the end of expansion being arranged in layers of decreasing dyness.

An enormous drop in temperature of the steam takes place during the expansion and exhaust of the steam, and the heat, therefore, passes rapidly from the hot jacket to that layer of steam adjacent thereto. The heat thus flowing toward the exhaust belt is to a great extract absorbed by the working steam and is trapped by the platon at the commencement of the compression stroke, instead of being sweep out out of the exhaust, so that this heat, transferred to the steam, is again transmitted to the end of the cylinder by the pumping action of the platon. The heat given up by the cylinder head to the steam in the cylinder is retained within the latter, since this steam is itself retained therein, so that the head presents the peculiar phonomenon of a heating jucket with no loss

in actual tests it has been found, when employing superheated steam, that the temperature of the cylinder wall at the inlet is higher than the temperature of

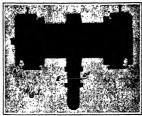


Fig. 1.—Uni-directional flow condensing engine



Figs. 2-3.—Forms of uni-directional flow engine

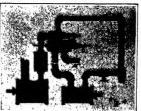


Fig. 4.—Controlling gear in place.

the stam in the jacket. In unddispetional repeats with since the points at which release and compresses begin are never varied, so that, in an emisse grayerly designed for its normal load, the compression is excessive when the engine is starting or remains at high loads.

Prof. Stumpt has recently patented a device whereby the excessive compression may be relieved. This device consists of an auxiliary exhaust valve which is connected to the cylinder and operates automatically. This valve may be cut out when not required, without interfering with the economic working of the engine during normal running.

The figures show two variations of this investion. In Fig. 2, the cylinder A, in which the piston moves, has auxiliary exhaust passages leading from the failers, which passages have pipes leading to a valve chamber is which there is located a steam operated valve, shown at F. The valve casing B is connected to the live steam inlet by means of a pipe D manually controlled by the

The entering steam, the valves  $O^*$  being open, passes into the cylinder and also through the pipe D into the casing B, and the valve P moves to the opposite end of the casing, movering the port C. The steam may then not only exhaust through the main exhaust ports controlled by the piston, but isno through the passage O to the casing B and port H. This exhaust continues until the compression pressure on the one side of the piston is greater than on the other, the auxiliary ath-aust continuing for a conditorable part of the stroke, whereby only a low compression is attained, such as is unfifted in to meet the requirements during starting or at high loads.

In Fig. 3, the plipe C is condited and the value T is actuated by the auxiliary enhance pressure through the plipe R controlled by the value S instend of the live steam as in Fig. 2. The operation of the derive shown in Fig. 3 is precisely the same as in Fig. 2, except that the exhaust steam operates the value T instead of the live steam. The values S are operated simultaneously by the rod S and the value T is of different construction.

By closing the vaives  $D^1$ ,  $C^1$  and B, when not required, the economic operation of the engine during normal running is not interfered with.

In the operation of blast furnaces it is necessary frequently to slow down one or both engines, and often it is destrable to run the high pressure engine alone or the low pressure engine atone or the low pressure engine atone, using boiler steam. This result is ordinarily secured by placing throttle and stop valves in the piping between the high and low pressure rendence and providing a separate throttle and a pressure reducing valve for admitting boiler steam at reduced pressure to the low pressure cylinder. A safety valve is placed on the receiver, or on the pipe between the high and low pressure cylinders, to allow the high pressure cylinder to exhaust outboard in case the receiver pressure builds up too high. These valves are all separate, and all except the safety and

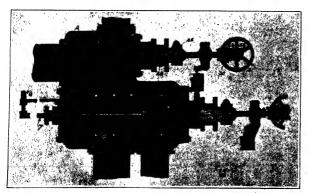


Fig. 5,-Detail of controlling goar shown in connection with cylinders and holler in Fig. 4.

San Sanda



Fig. 6.—Reciprocating classents and valve

they allow his manually operated, agents manipulsand and with the tr-in augment. Her produce the dustine is with that rescens, but it is clear the property or disting of the right is in eveny expanse or opening or if the wrong valves in right ing the errong waters in right sense, may cause one or both of the tries to stop. Constitut of the blast on would follow stoppage of both eawhich would reliev stoppage of both en-gines is a sections matter in blant furners operation, one of the consequent dangers being serious explosions of gases that work back into the blowing tube from the

forms all the functions of the above-tioned valves, many of them automa ally, renders it impossible to start of mible to start or to stop both engines by the manipulation of a single valve, and makes it impossible for ntal stoppage of one engine to our the stoppage of the other, has recently been patented by F. E. Norton of Younge

The Norton controlling gear, which is shown in Figs. 4 and 5, employs a casing A (Fig. 6) with partitions B, C and D, located between the high and low presre cylinders. Two cylindrical shells S sure cylinders. Two cylindrical shells 3 and 20 are placed in the casing A, thus providing two valve chambers in which the valves 5, 6, 16 and 24 are placed. The annular chamber 1 formed by the partitions is connected by a pipe to the exhaust of the high pressure cylinder and communicates with the valve chamber 4 through the ports 2. The valve rod 7 is manually adjustable by the lever 8 so as to cover or to uncover the ports 9 and 10. valves are so posited on the rod 7 that the ports 2 are never covered by th valves 5 or 6 within the limits of their varies 5 or 6 within the limits of their travel; that both ports 9 and 10 are closed in their mid-position; and that ports 9 are closed when ports 10 are open, and

The ports 9 lead to the chamber 12 communicating through the pipe 13 to the receiver 13c. (See Fig. 4.) The ports 10 lead to the annular chamber 14, communicating through the auxiliary exhaust conmeetion 15 to the condenser or atmosphere. The ports 11 are normally closed by the spring operated valve 16, the latter being forced to opening position against the ree of the spring 17 by excess of pres mre in the chamber 4

offer steam is introduced by the pipe 18 into the chamber 19 and thence into is into the chamber is and thence into the valve cylinder through the ports 22. The valve 24 is normally held is open posi-tion by the spring 25, permitting the steam to pass through the ports 23 into the nber 12, but capable of being forced to the right to a closing position by pres to use right to a closing position by pressure in the chamber 12 acting on the plunger 28. The pressure on the chamber 12 may be varied by changing the compression of the spring 25. This is accomplished in the same manner and by the plished in the same manner and by the same mechanism used in changing the compression of the spring 17. The rota-tion of the nut 30 by the hand wheel 31 through the gears 32 and 33 causes the through the gears 32 and 33 causes the rod 35 to vary the stness on the spring 32 at the opening position of the valve 24. It will these bo obvious that the valve 24 serves both as an adjustable pressure re-ducing valve and as a positively controlled throttle valve. Sudden movements of this valve are checked by the dash pot, showe and link arrangement, thereby securing a smoother action.

e operation of the device is as fol-The operation of the device is as fai-lows: Assuming that the valves 5 and 6 are to the right, giving free exhaust through ports 10 and closing ports 9, the low peasure eagine would use the intar-cel by maintenance are so the pro-mitted of the control of the control of the third vision of the control of the con-trol and run the low pressure engine on

he sists; ports 9 and 11, closed; ports 10, open; ports 26, partially and variably open, and maintaining approximately con-stant pressure in chamber 12.

This manipulation of the parts runs the eine "eimple"

To compound the engines, the spring 17 to compound the sengines, the spring it is adjusted to a pressure very slightly higher than the desired receiver pressure, an adjustment seldom requiring attention; then the spring 25 is set so that valve 24 will open at a pressure very slightly below desired receiver pressure; lastly, valves 5 and 6 are moved to their extreme left position by means of handle 8 acting or rod 7. The engines will now operate

Conditions now are: Ports 9, open; ports 10, closed; ports 22, closed, but ready to epen if pressure in chamber 12 falls; ports 11, closed, but ready to open

f pressure in chamber 4 rises.

If the high pressure engine be now accially stopped, valve 24 will open and supply steam to the low pressure engine that it will continue to run. If the low pressure engine be accidentally stopped, valve 16 will open ports 11 and allow the high pressure engine to exhaust in the pipe 15 so that it will continue to Normal method of stopping either engine: First convert to single expan sion operation by moving valves 5 and 6 to the right; then to stop high pressure pressure engine alone, draw valve 24 to closed position by the action of wheel 31.

This construction affords ease of manipulation and freedom from accidents stoppage, the evil effects of which have been explained.

In wool combing machines a rapid re ciprocatory motion without undue vibra tion is required to operate the brush or dabber which drives the wool fibers into the spaces between the projecting needles Most machines now used, even with care fully constructed, oppositely m ance weights, positively operated, are sub-ject to a residual tremor which is very disadvantageous.

A patent recently granted to Boys a Pierney shows a reciprocating engine fo producing such a rapid reciprocatory mo-tion to operate the brush or dabber of s wool combing machine

In Fig. 6, the hollow piston r tached to the brush of a wool combing tached to the brund of a wool comming machine, or to a mold box, or to any other device required to be reciprocated rapidly where little external work is required. The piston with its heads M and N comprises the working element of the machine and the cylinder C in which the piston op erates is attached to the wool comb chine frame by means of the springs 1

Tive sir or steam is admitted to the

port Q and the space between the head the platon is filled with the motive fluid which acting on the larger head M lifts the niston until the grooves R are un covered. The air then passes through these grooves and through the small pas sage 2 to the upper side of the valv forcing the valve upward against its spring T and closing the exhaust passage W from the space above the piston. Part of the air also passes to the space above the piston, where it is compre the piston, where it is compressed and acts as an air buffer or elastic finid spring. The pressure in this space now becomes equal to that in the space between the two heates of the piston and greater than that in the space 3 below the head N, and the whole piston is driven down-ward, compressing the air in that space. The exhaust valve S re mains closed the presure in the space above the piston falls in consequence of expansion to such an extent that the spring T overcomes the air pressure on the lower side of the valva,

squent pressure arising in the groover and passage 2.

The period of the stroke at which the

exhaust valve opens and closes is regu-lated by the screw. The passages O and P are provided to allow air to exhaus from or to enter the space 3 near the enof the stroke and so prevent creeping of the piston in the cylinder and ultimate ere of its motion

It will be observed that the trapped air elow as well as above the piston, by its empression, is most effective in returning the piston quickly, and this is one of the advantages of this method of effecting the reciprocation for extreme rapidity ove the method of eccentric driving now com monly used

#### Notes for Inventors

A Doll With Different Faces .- Chest Lombra of Meriden, Conn., has secured patent, No. 1,059,178, for a doll which has a fixed face and an extra face or faces hinged at the lower edge of the fixed face so that they can be turned down against the body of the doll or up over the exposed face, a bandeau being provided to hold the upper edge of the movable face when the latter is adjusted to position for use.

An India Rubber Substitute,--- A proce of producing an India rubber substitute is described in the patent, No. 1,061,881, to n of Crefeld, Gern In this process geletin is mixed with gly-cerine and with camphor, the latter being dissolved in acctone and the mass is treated with sulphur.

Artificial Signal Clouds Kübel of Washington, D. C., has patented a method of signaling, No. 1,062,782, in which cloud-like bodies are formed by chemical reaction and their discharge is controlled in accordance with the signal desired to be given. In discharging the cloud-like bodies, fluid pressure is utilized.

A Cranberry Dryer. - A patent. No 1,032,969, has been issued to Henry H. Harrison of Boston, Mass., for a dried entire cranberry having a vented skin and for the process of drying fruit in which the inthe proc terior of the fruit is vented through the outside thereof while retaining the integrity of the fruit; the vented fruit is afterward subjected to the action of a drying agent.

A Process for Tempering Copper.-William H. White of Hazleton, Pennsylvania, Hazleton, and one third to Jacob M. and Margaret Schappert of Dorranceton, Pa., has patented, No. 1,062,067, a process of tempering copper wherein the copper is heated to a high temperature and is imnersed in a hardening bath containing lime water from which it is removed as soon as it blows and is then placed upon a hard surface and struck with another hard surface.

A Way to Prevent and Cure Premature Baldness.—A patent, No. 1,062,025, to Bernard H. Nichols of Ravenna, O., shows a hat band having corrugations on its side which form protrusions and depressions which form protrainons and depressions, the purpose of the construction being to avoid interference with the free circulation of the blond to the soalp whereby the pat-entee claims to prevent and cure premature haldness

Electrical Rat Trap.-Henry Carter of Pittsburgh, Pa., as assignee of one half, has received with Raymond H. Pryor of same place, patent No. 1,052.957 for a rat trap in which there is a platform, an elecouting circuit and a motor circuit con trouled by the movements of the platform, the motor circuit acting to operate a clear-ing mechanism by which the rat will be thrown away from the trap after it has been by stepping on the platform

the head wheel SI antif open enough to attract and run when the valve opens and ext the valve state and run is head of the particular and the part

the controlling means including a plurality of contacts connected in multiple with the field winding of the kinematograph motor.

Improved Flexible Tubing .-- In patent No. 1,053,394, to Henry Hubbell of Ash-burnham, Mass., assigner to N. T. R. Al-mond Manufacturing Company, same place, is shown a flexible tubing which has an inner coil and an outer coil which is located n the convolutions of the inner with the inner surfaces of the convolutions of the outer coal given an ogee shape in cross section and engaging with the inner coal along a relatively narrow line in the normal position of the tubing.

Bill Nye's Prophetic Vision .-- Many years ago, before the days of the phonograph, Bill Nye wrote a humorous suggestion that an automatic machine be used for the delivery of political speeches from car platforms. Bill Nye httle suspected how soon talking machines would be reel-ing off political speeches all over this land of ours. They were used in the last presi-dential as well as in the one four years before. When skillfully employed they avoided "repetition or the wrongful application of local gags" which Bill Nye claimed as a great advantage of his pro-posed political machine

A Novel Photographic Process. ent whose purpose is to provide for photographing an object with any desired background has been issued, No. 1,053,887, Offigo Sonitag, of Erfurt, Germany. This patent includes a translucent serven slightly tinted with a non-actime color or a color having a weak actinic action. This screen is located behind the object and the face side of the object is lighted and the sensi-tized plate or film is subjected to a single exposure to simultaneously impress therein the images of the object and the projecting background, the background being pro jected upon the translucent screen from the opposite side thereof to that occupied by object to be photographed.

First Superintendent of Patent Office .--There hangs in the office of the Commisor of Patents at Washington a portrait of Dr Wm Thornton, the first superintendent of the Patent Office. The picture was painted by Gilbert Stuart whose porof George Washington are justly rated. The portrait was presented to clebrated. the Patent Office in 1871 by a mere of Dr. Thornton, Mrs. Talbot, widow of Hon. Isham Talbot, U. S. Senator from Kentucky. Dr Thornton was an intimate friend of President Washington, who, in 1794 appointed him one of three commissioners to survey and lay out the Federal capital. The Patent Office for most of the Doctor's administration was not very extensive, as we are told it consisted in 1816 of three persons: Dr. William Thornton, clerk, at \$500, and Benjamin Fenwick, messenger, at \$72

Three Wardrobe Trunk Patents. popularity of so-called wardrobe trunks is manifested in three patents, Nos. 1,051,-936, 1,051,937 and 1,051,938, issued to George H. Wheary of Raeme, Wis. The patent, No. 1,051,936, includes a novel construction of folding wardrobe section made of which legs are pivoted and adapted to be swung into position to support the wardrobe section when the is adjusted out of the trunk body and raised to an upright position. The patent, No. 1,051,937, provides a folding rack in connection with a swinging door, the rack being arranged to engage the door whe latter is partially closed in such manner as to foreibly close and lock the door in posi-tion when the rack is folded out of position for use. The third patent, No. 1,051,938, has the trunk body provided with an end wall which is mounted to swing outward and rest flat down upon the floor, and the wardrobe section includes a rectangular tray, one end of which is provided means co-operating with means on the swinging end wall of the trunk body whereby the tray may be secured to the said end wall when the said wardrob is adjusted to upright position for use as a

#### RECENTLY PATENTED INVENTIONS

Those columns are open to all patentees.
The notices are inserted by special arrangement with the inventors. Terms on application to the Advertising Department of the SCENTIFIC AMERICAN.

Pertaining to Apparel.

Shill II Laininia, 127 W. 26th 8t.
Maintain, N. Y., N. Y. in the prount patent
the atm of the inventor is to provide a new
and improved akir or petitional, arranged to
result) fit pranns of different when means
and to insure proper hang of the garment,
capically over the thip of the waters.

#### Pertaining to Aviation.

FORTIMING to AVMAND.

FILTING MACHINE —F. I. SCHAUPLE, MACHINE MACHINE, MACHINE MAC

'Of Interest to Parmora, BROOM CORN CLEANING MACHINE.—
E Coar, Colfax, Ind. In this case the purpose of the inventor is to provide a new and improved broom corn cleaning machine, arranged to thresh out the secola from the heads and simultaneously thin the butts with a view to produce chills of even length.

#### Of General Interest.

Of General Interest,
COMPUSHITON FOR 1 MPRENERS ON
RIBERTS, A W HARINGTON A BOURSMEEL A
and I A BOUTHWAIN, care of Alfred Rosentein, 188 Lafayette Nt., New York, N. Y In
this investion, an object is to produce a new
and improved impression absert by means of a
ove composition and method, which, when
applied in a certain manner, which is believed
to be zero, can be reproduced a number of

times

STREET BIGN-J. DONOVAN, chief of police, Pet Cheeker, N. Y. A horizontal har attached to a wall or pols, supports an upper and a lower plate parallel to the streets, the the provision of a slot in the har and the provision of a slot in the har and the provision of a slot in the har and the provision of a slot in the har and the provision of a slot in the har and the provision of a slot in the har and the provision of a slot in the har and the provision of a slot in the har and the provision of a slot in the har and the provision of a slot in the har and the provision of a slot in the har and the provision of the support or past while carries them.

ment needed is secured to caushlo the parts to be conveniently filted together when mounted on the support or past which carries them.

TOOTH BRUNH --J TI HANKIN, Station AND TOOTH BRUNH --J TI HANKIN, Station AND TOOTH BRUNH --J TI HANKIN, STATION AND THE STATE AND T

FOLLOWER FOR FILING APPARATUS -FOLLOWER FOUR FILING APPARATUS - J A Biest Augusta, Ga The invention re-istes generally to a follower or a card support ing member, the object being to provide a fol-lower factor, can as whereby it may be resulting to be a follower of the second and quickly and easily released when desired ACCENE, ENVICE, SOIL, FILING, ADIA.

other similar substance such as hitter, etc., may be cut from a container which holds the same in bulk and at the same time may be the same in bulk and at the same time may be the same in bulk and at the same time may be the same in bulk and at the same time may be the same in the same time that the same time in the same time in the same in

heads.

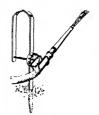
ARTHST'S COLOR BOX AND EASEL.—L.

E Kurar, USS Sixth Are, Mashattan, N. Y.,

N. This inventor provides a bost mounted
on supporting legs in position to hold a sketch
include the provides of the provides of the contracting the color of the color of the color of the color
means for holding a canvas in working position; provides a box, one side whereof forms
a holding-tray for tubes and tools used in
sketching; and provides means for packing the
box and parts connected the ewith to form a
small and convenient hundle

#### Hardware and Tools

Mardware and Teels.
TAPPINO DEVICE.—O. I. Human, Kensington, Kan In this instance the invention has for its object the provision of an inexpensive device for rapping a pipe containing a fluid, under pressure, without the loss of the fluid, and where the pipes are too this for the fluid, and where the pipes are too this for ADJUMTAILD HORS HOLDER.—I. P. BAILER, BO. 122, Mountain View, Cat. This invention relates to hose bolders, the object heling to provide a simple, strong and inexpensive device by which the nomise and of an ordinary hose may be conveniently and effect they held in various degrees of Belination.



ADJUSTABLE HOSE HOLDES.

ABUSTARLE HOSE ROLDES.

an example of the practical application of which is alsown in the accompanying illustrative with the sales of the result of the resu

in Proper position.

SAFITY RAZOR—T. J Fay, P. O. Boz 182, Watts, Cal. The blade is held in piece by a table compressor, and as the garard is marsh to adjusted to position to reprint the transit of the property of the prop

lower lawing means whereby it may be result; and effectively secured in adjusted position and quickly and easily released when desired and the control of the properties of the present investion is the provision of a locking driver by the me of which one or a number of non-alliend series of eards may no be locked against accidental displacement or camoral by manutorised persons common by manutorised persons. LARD CUTREM-A. W. Blazit and L. Miller and the provides a derive by means of which lard on of the this bubble description. The provides a derive by means of which lard on of the this bubble is an optical system to an adversarial provides a derive by means of which lard on of the this bubble is an optical system to act of the size of the instances of the control of the provides a derive by means of which lard on of the this bubble is an optical system to act of the first bubble is an optical system to act of the first bubble is an optical system to act of the first bubble is an optical system to act of the first bubble is an optical system to act.

as a lens, that is, the surface of the bubble forms one of the refractive or reflective sur-faces in the optical system so that the move-ments of an image due to displacement of the hubble can be viewed directly or by projection

on a screen.
CORK PILLLER.—A. Pissas, 47 Broadway,
Elizabeth, N. J. This invention relates to cork
pulsers and he particular reference to a conveniont tool for extracting corks of any size
or construction in a manner which will inserpositive shirty of the corks intert so that
they may be reused, it desired. The tool remover etripace cape from bottles.

posture desired, more than the posture of the postu

Heating and Lighting.

GAS ILLUMINATED ADVERTISING APPARATUS — F O. SETD, London, Rugland Address Day, Bavie & Bunt, 221 High Rollows,
have a series as the series of the series of the sample and long-partle valve mechanism which
may be readily adjusted, will require a small
amount of motive power to actuate it, and
may utilize the gas pressure in preventing
leads of the series of the ser

may utilise the gas pressure in preventing lenkage.

GASQLINE LIGHTING APPAHATUS.—A TROCETS, McCture, O., Address Orville doubt, and the state of the control of the contro

#### Bousehold Vtilities

Household Utilities,
TANE DUWN (VIOK RANGR—O, Frazza,
care of Eugene Iron Works, Eugens, Ore. The
present invention relates generally to scores
and more particularly to cook ranger, the object being the provision of a cook range which
may be taken down and conveniently packed
upon the back of an azimal used for such parposes

upon the back of an animal used for such parpones

CLOSHYT – K. M. Anderson, Si3 R. 13th St.,
Winfield, Kan. The tuvention applies more partrudarly to cleast a which cannot be connected to
the control of the control of the control of the conand to also make the closed typerod. It provides a closest wherein the opening to the vault
is automatically closed when not in use, and
a ventilating fine provides for the exceptement
of obtaining significant continues, and
a ventilating fine provides for the exceptement
of obtaining perturbately in tenement houses
and places where the line is attacked to the
framework of a window, or norse a window
The invention permits the line to be cateaded
into the room through the window during places
the end of the line settlement of the reason
and places where the line is attacked to the
framework of a window, or norse a window
The invention permits the line to be cateaded
into the room through the window during placing
the end of the line settlement can be a set of
the distribution of the line of the control of the line.

Light 171MG AND YENTILATING APPA.

may no removes without canaging the tendenand the property of the property o

properly dispensed in the inclosure.
TOWEL RACK.—A. H. HOWE, 875 Trinity
Ave. Bronx. N. Y. N. Y. This invention is
especially intended for use with hot water boilors used with kitchen ranges, the arrangement
of parte being such that an article of this class
may be produced at a low cost and sold at a
corresponding price.

FLOAT VALVE.—F. SCHUR: 35 Elm St., Albany, N. Y. The invention relates to finshing

tanks and provides a Sembonesvilled tanks valve, arranged to insure a prince opening same closing of the valve agrifus, it is given by the water supply to direct the becoming same in a downward direction, to governed granted aquirring, at the same time replacing fine valve practically hospiess, to Freder the valve saff clossing of sediment and other activatories matter and to prevent the valve saff.

THE REAL PROPERTY.

cleaning of sediment and other articlescent matter and to prevent the varier Prices Miching.

MOD.—T. W. Laming, 179 Nearrand Ava., Proceedings, N. This Insertation refies to inspectation in mone. Which is emperically edupated to write up the moisture on doors, counters, stands, or any other place that requires to be cleaned and first.

RANGE AND STUVE.—E. C. COLR. Cole Mig. Co., 218-28 S. Western Ave. Chicago.

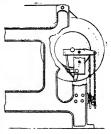
111. Herestofore manufacturers had absented for the control of the con

oven best.

PERCOLATOR—J. J. O'Mass. 1875 E. 8th
St. Brooklyn, New York. This device compulses a main reseal. A heating chamber baying an oatiet projecting tuto the main vessel, a
pyrolating tube to coavey heated fluid from
the chamber to the material from which the
luridon is to be made, and a relevelyt union
for removably connecting the tube and the
outer part of the chamber, the muon having
the chamber from the main vessel.

#### Machines and Mechanical B

Machines and Mochanical Betrees, LET-OFF MOTION FOR LOOMS,—1. COU-LOMES, 53 Riverview St., Fall River, Mass. Mr Coulombe's invention is an improvement in let off motions for looms, and has for its object the provision of a device of the char-



LET-OFF MOTION FOR LOOMS.

LET-OFF MOTION FOR LOOMS.

LET-OFF MOTION FOR LOOMS.

cetar apacified, wherein the tension on the warp beam is controlled by the weight of the year on the beam, and wherein the arrange to the beam, and wherein the arrange but the same to regulate the tension thereof.

BRAKE BRIT LINK.—I COULDAMS. So Elizeriew St., Fall Riere, Mass. This invest-or furnishes an improvement in brake but links, which has for its object the provision state of the provision of the pr

proper position.

BOTARY PUMP.—W. A. SHOORD, 76 Pleasant St., Franklin, N. III. This investion has reference to rotary or contrigual pumps for water or other fulfe, and such as are adapted with the state of the st

sol or the like.

MDICATINE MEANS FOR BOLL FILER.

—H. M. BROLE, Boom 414. National Exchange Frank Bidge. Reason v. A. This inswelling provides indicating means for roll films arranged to enable the user of the oames containing the roll siles to observe the unwinding of the film without moduly straining the crysts or containing the without moduly straining the crysts or operation of the containing the containing the containing the straining of the straining the product of the containing the conta

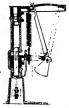
and the state of the state of

Suppositi CHA BURNO MECHA NISS.—H. S., SEPANON, such at J. R. Jeskins, 1864 Evocking, Jaw McCarle, S. E. The principal object of the investor is to provide a sighout character of the investor is to provide a sighout character of the investor is to provide a sighout character of the investor is sighout character of the investor of the control of the investor of the control of the investor of the control of the investor of the i

ing operation.

BUTTONHOLE MARKING MACHINE —E.

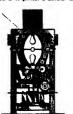
T. Adams, care of the Adams Mfg. Co. Portamonth. Oblo. The purpose in this invention
is to provide a device by means of which the
buttonboles of shoes may be marked quickly
and accurately with a minimum of labor. A



BUTTONHOLE MARKING MACHINE

further object is to provide a machine which is solf contained, sil parts being carried by a single standard or upright, and which there fore takes up little room. The marker is of novel form, and means provide for simpli tancously adjusting all the markers.

ARTIFICIAL-LIGHT PRINTING MA-CHINE-E. J. BROLAN, 28 Portland Place, Yonker, N. Y. The improvement refers to davices for producing bits prints and the like, and the aim is to provide a machine arranged



ARTIFICIAL LIGHT PRINTING MACHINE

to properly superimpose the sheets of tracing paper and the sensitive paper, and to cause the same to travel past a source of artificial light for things a proper exposure, and to shally separate the sheets of tracing paper and the exposed sometive paper for removal from the medium.

the meritine.

HANDPIRCE FOR DENTAL MACHINER.—
C. E. Nostman, Thoray, Ais, This invention refers particularly to a sevice which comprises a shall provided with a shall, and mass assessment to the shall are shall was a section with the shall are shall when the medium of the shall for the shall are shall as many is adjusted through the medium of the shall for the sh

A Company of the Comp

readily counseled with or detached from the head of a cylinder to be driven by and shaft; the parts being so formed and operated that the shaft and head are not readily disengaged except when the operator desires.

This lawords not consider that the consideration of the considerati

the beddle frames. CUTTER FOR PAPER HOLDERS.—M. L. BERGETON, Williams, Aris. The invention provides an inexpensive device capable of atland ment to saisting bolders without change in the holder lizelf, and wherein the cutting device is actuated by a continuation of the same nonement that withdraws the paper from the nonement that withdraws the paper from the

movement that withdraws the paper from the holder.

PRESS.—P. L. SERWE, care of Neews & Co., Inco., 100 Main St., Seatin, Wash This in-provement pertains to hand presses for press late to provide a press which is very simple, durable and exceedingly strong in construction to readily withstand the pressure to which the press is subjected during use.

MACHINE FOR FORMING BARREM, NTAYSB.—F. M. KENESD, Clarendon, AFA. In the press is subjected during use.

MACHINE FOR FORMING BARREM, NTAYSB.—F. M. KENESD, Clarendon, AFA. In the press is subjected during use.

THOMAS TO THE SECOND STREET, STREET,

Prime Movers and Their Accessories.
MEANS FOR COOLING COMBUSTION EN
GINBS.—IL S. Wessels, even of Far West
(GINBS.—IL S. Wessels, even of Far West
This Inventor provides meens for rooting the
cylinder and platon of as internal combination
units by the use of atmospheric air or other
cooling medium il to uses usens arranged in
side of the cylinder and platon of the anglato dresists of cooling medium through the

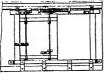
Ballways and Their Accessories.

ADJUSTARLE CAR STEP — J. H. VAROHAN, SSO Palasetts Ett. Mobile, Ala This invention SSO Palasetts Ett. Mobile, Ala This invention comprehends more capecially a small stair adapted to be mounted upus a cer platform or other suitable portion of a car body, and provided with a step sition, and provided with a step sition. In Clarecton Control of the Control of virtually inenthesing and shortening the latter.

INON HANDED.

Inter.

IMON HANGER.—M. Mock Address D
B 8860d, Heeville, Tex This lavention re
lates more particularly to siding, car doors,
and the object is to provide a door, the move
ment of which will be free and easy. To this
and the door has upper supporting altruphe
carrying roller guided members and connected



by a member which is movable freely through a roller carriage having a limited movement on the door frame. The engraving herewith shows an elevation of the side of a car, libus-trating the practical application of the door

1,1

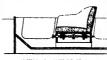
contained with the shell and shelf whereby a legislated through the medium of the modium of the modi

wided to turn the crank-shaft to raise and lower the shovel, and means to propel the truck on which the shovel is carried.

INDICATOR-T. G. FERTURE and W. Loraldon, care of Vitagraph Co., Santa Molira. Cal. This improvement comprises means for indicating in the daytime and at sight the direction in which the rebile is about to turn and the fact that it is about to come to a stop, of the care of the care

tag carrier.

ADMUSTABLE SEAT—1 L STANGER, Pensaukes, N J, and C. R. Fiffitas, Philadelphia,
Pa. Address the former, care of A Gentel,
1603 California Ave, Philadelphia, Pa More
particularly this invention relates to adjust



ADJUSTABLE VEHICLE SEAT.

ADJUSTABLE WRITCE BRAT.

ADJUSTABLE STATE UNE ON volvider and more especially to automobiles. The principal object is to provide a soat and usena whereby it may be moved to different relative positions, thereby adapting it to the comfort and convenience of different people. The invention also provides an mean for adjusting the seat relatively to its augport which can be the operation simple. Per blance for any of the convenience of the provider and the operation simple.

ENGINE STARTER—d. J. SPORMER, care of Wilson Moor Starter Company, Franklin, Pa. The invention relates more particularly to mean for "turning over" the internal combustion engine of an automobile. The device climinates objectionable features of the odd by ass of a compressed field. The engine in alarted by merely actuating a lever placed within convenient reach of the driver.

FOOT WARMER—J PILLIPICK, JR., Box

within convenient reach of the driver.

FOOT WARRER—J PHILIPOIK, Jr., Box
168, New Canaan, Conn. The invention proused in automobiles, aeroplanes, and other voused in automobiles, aeroplanes, and other voused in automobiles, aeroplanes, and other
passes from the motor and to prevent overheading of the feet or burning of the above of
the user.

Designs.

DESIGN FOR A GEM SETTING—IL ACKmanas, 51 Meldon Laur, New York, N. Yaldesign its characterized by a sealinged form of
extending which is very ornamental and at
leading the characterized of the sealing of the
extending which is very ornamental and at

Iractive
DESIGN FOR A PRUIT KNIFE.—R. B
LYDICK, 550 Shoridan Avo., Pitteburgh, Pa
this ornamental design for a fruit knife
the handle is heautifully serolled. The blade
is short and its curved lines produce a very
original and graceful effect.

original and graceful effect.

MERION FOR A GOBLET—W. B HUNTEN,
MORRAHOWN, W. S. In this ornamental design for a gobiet the bowl is materially round
with an attractive fange founding the riu.
The atem is straight and alight which connects
the bowl and the base

The stem is straight and silght which connects the bowl and the base INSUIN GLASS —— DREIGH FOR DREIGH FOR THE STATE OF TH

#### NEW BOOKS, ETC.

MECHANICAL DRAWING. A Treatise on Technical Drawing as Expressed through the Medium of the Graphic Language. By Otho M. Graves. Easton, Pa.: The Chenical Publishing Company, 1912. 8vo; 139 pp.; illustrated.

Svo; 139 pp.; illustrated.

"Mechanical brawing" is a well-ordered course of study in which certain vital principles have been held in mind. It aims to teach the grammar of the graphic language so interestingly as to avaken the creative faculty of design at the same time that the student is being trained to mechanical oxecution.

QUESTIONS AND ANSWERS ON THE PRACTICE AND THEORY OF STEAM AND HOT WATER HEATING. By R. M. Starbuck & Sons. 16mo; 135 pp.; illustrated. Sons. 16 Price, \$1.

Prior, \$1.

Mr Ratabuck has been very successful in com-pilitie, exacehisms on santary plumbing, and this series of questions and asserses on the subject of stoam and hot water healing will no doubt prove acceptants to the trade. This fourth edition in-tuides chapters on vacuum and vapor healing and socienated hot water healing, with numerous tables, rules, and "tricks of the trade." and a wealth of miscellamous faformatics.

weath of miscellascous information
BRAING. AP Preducal Treatise on
Tools, Material and Operations For the
Use of Metal Workers, Plumbers, Timnors, Monhaire and Mannfacturers, By
James F. Hobart, M.E. New York: D
Van Nostrand Company, 1912. 12mo.;
190 pp.; 62 illustrations. Price, \$1 net.

180 (pp.); O'2 lituatrations. 271cc, \$1.0ct. A giance timugh the detailed index will at once convince the reader of the astonishing amount of information conveyed by the little handbook Soldering and brasing are operation constantly called for in a number of arts. critic, and industries, and are by no means so easy of efficient accomplainment as its generally supposed.

The Manual of Statistics. Stook Exchange Hand-book. 1913. New York: The Manual of Statistics Company, Svo.; 1104 pp. Price, \$5.

Svo.; 1104 pp. Price, \$5.

This indisposable work of reference comes to
us this year for the thirty-fifth time, as full and
accurate a sew - Thumb-indeed, it makes immodiately accessible a fund of information concerning the most time to a full of information concerning the most time to a full of information concerning the most time to the information of the
change quotations, high and low, for 1910, 1 11,
and 1912, and it concludes with production and
price statistics of the v-rious commodities of the
v-rious commodities of the
viril in short, it is a manual whitool which the
fivestor can scarcely be called complete

trivintor can scarcely be called complete.

THE GASOLINE AUTOMOBILE. Its Design and Construction. Vol. II. Transmission, Running Gear and Control. By P. M. Heldt. New York: The Horseless Age Company, 1913. Svo.; 522 pp.; illustrated.

illustrated. Continuing his exposition of automobile design and practice into this ecent volume, the author seeks to cleanify the various possible constructions of the different parts, stying formule for necessary dimensions. Init avoiding descriptions with the continuing the continuing of the different parts, stying formule for necessary dimensions. Init avoiding descriptions whole unchinery of transmission, fr m frietion cut on to road wheels, in most theroughly and carefully sublitted in text and illustration. An appendix gives table of loads and dimensions, and in continuing a second production are shown full-page photographic trave of all products places are all the continuing and the continuity and the continuing and th

THE GROCKE'S ENCYCLOPEDIA. Compiled by Artemas Ward New York: 50 Union Square. 4to.; 748 pp. Price, \$10. by Artemas Ward New York: 50
Union Square. 40:: 7480 p. Prico, 810.
A more sumptious book has rarely come to the
reviewer's table. Its beauty is as great as "The
Book of the Pearl" Revey article of food and
drink is elaborated on in a musterly manner and
we should rather term him. gathered this vast
sagregation of facts embellished with beautiful
illustrations and a bevildering array of color
plates largely from the objects themselves—
finit, vegetables, fish, reast, nata, etc. The
model a salesy adopted. It is almost impossible
to call attention to any one feature, the work
he is uniformly sustained, but the beautiful colcored lateout for any one feature, the work
he is uniformly sustained, but the beautiful colcored lateout for the property and the property of the
satual members used in this preparation of food,
set, are much to be commended. It is to be
hopod thaig grower sure in the previace of it conveys is worth many times its moderate costs. As a
work for the library, public or private, it was be
in much ploause. Mechanically the book is wellnikh perfect, paper, typography, color plates—
ververbing is housely later ones thereone, A knowledge of the contents would post any housewite so that the would become a discrimination;

Matoryrous, hus Excerned Louvers. By
W. Hilbert A. M.I.E.R. New York: Norm—Copies of any ...

Norm—Copies of any ...

So farminded by the Schemfield ...

We wish to call attantion to the fart that we say in a position to reader competent services in every inranch of patent or trade many work. Our staff is composed of mechanical, electrical and chemical caperate, thorough the specification in the company of the specification of the company of the company of the specification of the company of the company of the specification of the company of th

## The Ten Greatest **Inventions of Our Time**

We hear much of the great inventions of the pastthe telegraph, the sewing machine, the telephone, the reaping machine, photography, Bessemer and open hearth steel, the steam engine and the phonograph. Yet the inventions of our own time are as epoch-making and as dramatic as these.

Perhaps because we have become accustomed to the use of the old machines and discoveries, perhaps because the achievements of latter-day inventors succeed one another so rapidly that we are not given much time to marvel at any one of them, we have not fully realized how stirring and wonderful are the products of modern

Only five years ago the man-carrying aeroplane made its first public flights; only the other day hundreds of passengers on a sinking ship were saved with the aid of wireless telegraphy. At least a dozen inventions as great have been perfected in our own time, and all of them have made a man's work count for more than it ever did before, and have made the world more livable than it ever was.

Why should we not tell the story of our own deeds? Why should we not review the industries created by men who are still living, men whose names will go down into history with those of Watt, Morse, McCormick and Howel

That was the underlying idea of the November Magazine Number of the Scientific American. We knew that the "ten greatest inventions of our time" was a big subject when first we planned the number, but how big it was we never realized until we surveyed the field of modern invention.

Then we saw how astonishing was the progress made in our own day, how much mankind had benefited by the inventions of great modern intellects. We began to appraise inventions, to weigh one against the other, and to determine in our own minds which ten had contributed most to human progress and happiness, which were really great pioneer inventions, and which merely remarkable and valuable improvements on successful past conceptions. There were so many achievements to consider that it was hard to arrive at a definite conclusion.

The upshot of our own thinking has been to leave to our readers the decision

### What Are the Ten Greatest Inventions of Our Time. and Why?

For the Three best articles on the subject, we offer in the order of merit, three cash prizes:

First Prize: \$150.00 for the best article Second Prize: \$100.00 for the second best article Third Prize: \$50.00 for the third best article

See last week's issue of Scientific American for conditions of contest.

Curious Resemblances in Nature

(Concluded from page 34.) nted by the head of the "swan") where they are brought into contact with ential, or sexual, organs. In this chamber the flies are held captive. Those which have come from other blooms bring pollen with them, and thus effect the pollination of the pistil. Then, when the stamens attain maturity, the whole company of imprisoned insects get dusted anew with polien; and not until the flower fades, and the hairs in its throat

Perhaps the most striking of all floral esemblances is that presented by the resemblances is that presented by the staminal column (the petals having been removed) of the Brazilian milkwort known as Schubertia (or Araujia) grandi-flora. The likeness is that of a benevo-lent looking old gentleman, every feature peing most perfectly portrayed; while, as rotated from right to left between the fingers, the visage appears three times in succession—the right eye of one face be coming the left eye of the next, and so course this remarkable apparition is merely coincidental to the structure and roloring of the parts concerned. It has no direct bearing upon the adjustmen of the flower to its environm theless, it calls our attention to the union arrangement of the essential organs which characterizes the natural order Asclepiaduceae. As in the case of the orchids pollen is combined to form man which are torn away bodily by an insect of appropriate size and carried to another bloom. In the case of the Schubertia, the insect, coming to the flower for the nectar which it secretes, pitches upon the staminal column, and sooner or later gets its that column, and sooner of later gots are feet into the long, gaping slits—one of which is seen to each aide of the mock face. As the insect attempts to escape, its feet are guided upward, and become wedged in a narrow notch in the black disks or "clips" (the "eyes" of the face), the disks, together with the pair of poller masses attached to each. When large and powerful insects are involved, the device works to perfection; but small insects are able to effect their escape, and are held captive by the flower until they die-a contretemps which defeats the object (i. e., cross-pollination) for which ate contrivance exists. On this account these flowers are often spoken of as "cruel flowers" or "pinch-trap flowers." But when a powerful insect drags away a pair of pollen-masses, the latter undergo a remarkable twisting movement, by means of which they are brought close together. This facilitates their insertion into the stigmatic chamber of the next bloom which is visited by the insect. In the vicinity of these flowers one may often capture large wasps and other insects with large numbers of pol-len-masses, or the clips from which the

florescence, of the sweet sedge (Acorus calamus) deserves mention because of its striking resemblance to a round file. The plant belongs to the order Orontiaceae (allied to the Arums), and is a native of Eastern Asia, although it has at Eastern Asia, although it has spread to other countries, and is conserved in South-ern Russis, whence the rhizomes are ex-ported. They yield an aromatic stimulant and tonic bitter, which is employed medicinally and for flavoring beverages. sence is a spike of small, closely crowded hermaphrodite blossoms which open in rotation from below upward. Selfpollination, or autogamy, is out of the polimation, or autogamy, is out of the question, because the stigmas of the indi-vidual flower fade before its anthers open. It is true that the stigmas of flowers in the upper part of the spike become recepwithout the assistance of insects. Kerner that in Purcey, where the plant is not indigenous, it is always startle. But further saw, where the plant is not indigenous, it is always startle. But further saw, where the startle. But further saw, where its deep plant is not indigenous, it is always startle. But further saw, where the same plant is not indigenous, it is always startle. But further saw, where its deep plant is the given in the case of the given in th

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oury aptly company "strong box to which has the key;" for it is a smaller bees rarely set long-tongued bee to bring about its pollination. It is, indeed, a ki nel, into which the insect visitor crawl to reach the nectar which is ed at its extremity. At the entre this tunnel, press the pollen-covered anthers, and an exam inution of the flower shows that an and other insects, could they gain access would crawl down to plifer the hom-without touching the anthers at all. large bee, on the other hand, file up the the pollen with its hairy back. facts explain the tightly-closeed the snapdragon bloom, which call for a large, robust insect to force them apart.

Perhaps the most curious part of the ragon, however, is its irregular seed capsule. The accompanying photograph might pardonably be mistaken for a collection of skulls in some muse section of skulls in some museum. Tet it really represents a few snapdragon pods mounted on pin-points. The three holes which seem to represent the eyes and mouth are, of course, the orifices through which the ripe seeds are ejected.

This article is not intended to furnish complete list of curious resemblances which occur in nature, but merely to point out a few of the more striking, and to out a new or the more striking, and to show how they may be utilized, as aids in teaching. If the reader will exercise his own powers of observation and imagination, he will experience no difficulty in discovering a well-night endless serie subjects. In the patterns displayed by insect's wings many very diverting de sects whigh many very diverting designs and pictures may be traced, four of which we illustrated. Perhaps the most striking of all is the "80" mark on the bludwing of the South American butterflies called Caiagramma. Of course the figures are not perfectly distinct in every species of the genus; but generally the hind-wing displays on its under-surface a more or less obvious "80" or "88." Hence, collec tors in Brazil often term these butterfi "eighty-eights." The white markings The white markings on the thorax of the so-called "death's head" moths are also very impressive, being a very good imitation of a skull and cro s, and reminding one of the insignia of a famous German cavalry regiment. In German Poland, where the moth is espederman Fusion, where the mous is septerally common, it is known by such names as the "death's head phantom," and the "wandering death-bird," and is the object of much dread among ignorant peasantr. The great Indian "snake" moth (Attori atlas) gets its name from the fact that len-masses, or the clips from which the the tip of each fore-wing suggests the police has been detached, fixed firmly to bead of an angry cobra seen in profile. The very remarkable flower-spike, or in-curious and beautiful designs upon their florescence, of the sweet sedge (Acorus wings, witness the "drooping but" discussional deserves mention because of its played on each fore-wing of the well and the winds and the work of the well and the work of the work of the well and the work of the the tip of each fore-wing suggests the known "moon" moth (Acties land). These and many other patterns on the wines and many other patterns on the wings of butterflies and moths constitute a stora-house to which a rities and designers might well go when they stand in need of in spiration. Indeed, certain conventional designs almost certainly trace their origin to the wines of unands. The farsons in to the wings of insects. The famous Indian and Cashmere shawls, for examp reproduce in their patterns the colors and markings of butterflies which belong to the genus Cethoeia,

As to the manner in which Natu duces these designs on the wings of but-terflies and moths, the following brief description may be given—this being really important point to which the tr tery interest aroused by the designs t serves should be made to lead. The



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clothed with a more or less dense growth of hairs. Now these hairs Nature has taken in hand as her material for picture-making. But she has not left them as mere hairs. She has modified them in a wonderful way. Butterflies and moths wonderm way. Butterfiles and moths make up the order Lepfdoptera—a word made up from two Greek substantives which signify respectively a "scale" and a "wing." Why? Because the membranes of these insects wings are clothed with a multitude of minute over-lapping scales. And these scales are really modified hairs They grow out from the wing membran in exactly the same way, while a complete series of transition from hairs to scales may often be found in a single species. hay orten be round in a single species.

As to the manner in which this modification may have proceeded, we shall gain a fairly clear idea in the following way.

Let us first think of a hair as a cylindrical bag closed at one end. If, now, we prebag closed at one end. If, now, we pre-sume this bag to be formed of an expan-sive but non-elastic material, we realize that it could be readily infasted and flat-lened. By this process, in fact, the cyli-drical bair could be converted into a flated scale; and there is little doubt that tened scale; and there is little doubt that in this way the scales of insects wore de-rived. Attached to the wing membrane by short stalks, and looking like so many little battledores or rackets of innumer-able queer forms, the scales are restly flattened hairs.

Now among certain primitive insects which live in dry situations, scales seem to be useful as a means of retarding evaporation. The quaint little creatures known popularly as "silver ladies" or "sil-ver fish" (Lepisma), which we find in our Their bodies are covered with a dense growth of beautiful slivery scales; and by this means a too rapid escape of moisture this means a too rapid escape of moisture from the surface of the body is presented. Indeed, none of the scateless silies of the "silver ladies" can live long in a dry atmosphere; they literally shrived up—Nature having intended them to dwell among moist surroundings. But in the case of butterflies and moths, no such purcase of butternies and motin, no such pur-pose is served by the scales; so that we may regard them simply as a basis for the development of color and color pat-terns. Nature uses them, so to speak, as so many stitches in a tapestry of marvel-

#### German Inventors and Office Furniture

IN the report of an exposition for office furniture held in April at Frankfort, it "rumiture need in April at Frankfort, it is said that the exposition furnished convincing ovidence of the increased interest taken among business concerns in Germany in improved office appliances and showed in improved office appliances and showed also that the German involvor and manu-facturer is alert to the value of trade in such appliances and is equipping himself to secure a larger ahare of it than he has heretofore had. Referring to typewriter exhibits, it is suggested that much stress was placed on the various things that the machine can do saids from ordinary type-writing and that it is safe to say that German inventive effort will be directed along these lines and that much will be German inventive enort will be directed along these lines and that much will be made of such improvements as selling points. If these features are of interest to German inventors, they should equally interest American inventors who have already done much to develop office ap-pliance and particularly along the type-writer improvements.

#### The International Congress of Zoology

THE International Congress of Zoology was held recently at Monaco under the patronage of Prince Albert, whose emithe patronage of Prince Albert, whose suit-nent position in occanographic work made this solic doubly fitting. It will be remem-hered that the original promoters of modegy congresses were the Franch action tists Mine-Edwards and Blanchard. The these Mine-Rowards and Blanchard. The congress in held every three years and assembled in the citize of Paris, Moscow, Chainteldas, Berlin, Lepdon, New York, Serpe and Gritts, it is probable that in 1926 in will be held at Budapest and in 1926 for Stone.



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#### The Industrial Need of Technically Trained Men-V A Variety of Avenues Open to the Young Man of To-day

By A. B. Quincy

nel into which to direct his energies for the life before him, there are to-day a We will sup multitude of avenues open. We will a walk in life which is hased on one or other of the applications of science. This limits his choice somewhat, though not very greatly, for at the present day the majority of commercial and professional mands for a training based upon scien tific study. But what are the various sciences and their applications open to We will attempt no systematic order of commeration. Suppose we begin with the biological sciences. There is botany, at the root of all plant The farmer of to-day cumol afford ture. to be ignorant of the fundamental principles of botany, and who has not hear of the wonderful achievements of Lathe Burbank, based on an ingenious applica tion of the principles of heredity, which we only now beginning to unde But it is not only in the cultivated field that the applied botanist finds work to do. The dendrologist, specialist in the botany of trees, lakes care of our forests and tells us how to utilize their product to best advantage. Then there is the "plant doctor," akin to the veterinary surgeon, but giving his attention to plants instend of anima

And as a special branch of botany there is bacteriology. We have beard so much of bacteria as breeders of disease that we are perhaps sometimes apt to forget that we have friends among them as well as foor. There are first of all the seavence bacteria, without which we should be hard pressed to get rid of the sewage of our great cities. And there are bacteria in the soil, whose action is indispensable to the higher plants growing upon the soil Again, we have a number of fermentation industries depending upon bacterial ac tion—the manufacture of cheese, vinegar, beer sleohol, and so forth

The medical man is, of course, keenly interested in bacteria, not only as the cause of disease, but also the means for producing null-disease sora, of which the diphtheria antitoxin is the shiuing ex

Zoology chains its own share of the prizes won by modern industries. Her niso the application of the laws of heredits will in the future greatly assist th animal breeder in the proper selection of his stock And that delicate balance which is struck in nature, keeping each species in its proper proportion, has been studied with important results in certain cases where some one species threatened to become an unmitigated pest, unless it were possible to find an enemy who would feed on that species and thus keep it with in reasonable bounds

Another of the natural scie is commonly studied in conjunction with one or the other of the engineering sciences, although many will find it both pleasurable and to their advantage to specialize here. Geology fluis many applica tions, not only in the mining of coal, ores gens, building stone, and so forth, bu also in civil engineering, wherever founds tions have to be luid, a road built, or a water supply provided.

We have so far considered what might to entitle to further in sciences, as dis-tinguished from the "experimental" sci-ences, such as physics and chemistry. All oughiering is of course applied physics. person.

To the boy leaving high school and But at the present day looking about him for the best chan- cial branches of ongine ent day a number of spe ering have com into being, which are rather more closely connected with the parent science, and therefore require a particular familiarity with the principles of physics. As ex-amples may be mentioned telephony and telegraphy, both of the older type, and wireless

But we have not exhausted the scien One of the most important, to the bush ness man, we have not mentioned; econics. All husiness transactions fall in es transactions fall int the province of this science, though it no doubt interests particularly the banker the financier and the legislator. The truth is, no one should to-day be ignorant of the fundamental concepts of this scient Yet probably no science is so negle In one special field this science

late come into prominence, though its name is not often mentioned in this connection : namely, in efficiency engineering The basis of all our actions is the er despur to raise to a maximum the sun total of the pleasures which we can derive from our activities. Now one way to increase this pleasure is to either increase production without changing the labor re quired for il, or else lo leave production inged, while decreasing the labor in volved The "efficiency" engineer has come to show us how to do this The importance of his work rises pari passa with ie ratio which the cost of labor bear to the cost of materials in the production of a given commodity. An example may serve to illustrate this Suppose that for a certain article A the cost of material is \$10, the cost of lubur \$1, and that the efficiency engineer sleps in and reduces the labor item by one half, to 50 cents The total cost of the urticle has been changed from \$11 to \$10.50, or by about 5 per cent Now suppose that another article B costs \$1 for material, and \$1 If in this case the efficiency engineer reduces the cost of labor to 50 cents he has effected a saving of no less than 25 per cent! Anyone who has had unything to do with the manuf un article in which the cost of labor is the chief, or an important item, winppreciate the importance of this. will fully

No attempt has been made here to approach an exhaustive review of the dif terent fields of applied science to which the young man looking out upon life may turn . In point of fact, though his prin l attention may be given to one or which we cannot stop to consider, no me can afford to allow "specialization" degenerate into a more narrowing down to one thing, and the modern man of af folia must have more or less familiarity with several—the more, the better—of these disciplines. It is generally found that the specialist worthy of the name knows a great deal more about fields out-side his chosen one, than most others who do not claim to have specialized. And in framing his course of studies the young student will do well, so far as his means permit, to avoid premature specialization Once a good solid foundation of genera knowledge is gained, it may be very much rower field to which to pay special atten tion. And he may find it both cong and profitable to sleer somewhat off the old beaten tracks, and take up one of the newer developments of science. this he should be guided by the advice of ome thoroughly mature and competent

#### New Director for the Leander McCormick Observatory

S AMUEL ALFRED MITCHELL, Ph.D., parallaxes with the 40-inch telescope and Professor of Astronomy at Columbia also the spectrographic investigation of University, has been appointed director the motion of stars in the line of sight Chiteratty, has been appointed director the motion of stars in the line of sight of the Leander McCornalch Observatory At the University of Virginia, in addition at the University of Virginia, Frof. Mitchell is unit separate absoluted year's make a special feature of photographic leave from Columbia at the Yerkes Observatory, where his chief work has been known to the readers of the Summyriro the photographic determination of stellar Amsteans as a contributor.



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#### THE EDISON Concrete

How it is constructed, how much it will cut, is it prac-tical from an architectural and engineering elandrount





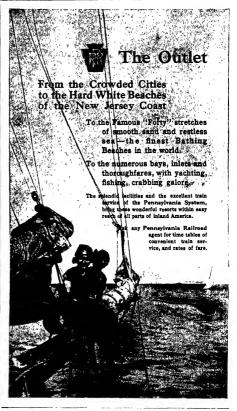
Kindly keep your queries on acparate sheets of paper when corresponding about such anatterns and paper when corresponding about such anatterns and paper and

(12825) R. E. H. asks: Can you give me, through your columns or by letter, a formula for soap bubble solution? A. We do not know any better soap bubble solution? A. We do not know any better soap bubble solution than that made from sood Castife soap, pure soft water, and gipterine. The book by C. V. Start, and the soap bubble solution that water has been seen to the interesting subject. You will find interesting articles on soap bubbles in our Servicesary, Nos. 583, 579, 684, price to cente each.

subject. You will min interesting arteness on soap bubbles in our Servetauren, No. 305, 379, 584, price ten conta cach.

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# Another new and decidedly progressive development in motor car construction will distinguish the 1914



There have been three important epochs in the development of the motor car. They were the three important epochs in the development of the Cadillac. The history of the Cadillac is the history of motor car progression.

#### The First Epoch:-

Eleven years ago the Cadillac Company produced the first practical and durable motor car in large numbers. How practical it was: how durable it was, the whole world knows, since these eleven year old Cadillacs are still in commission.

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Three times has Cadillac progression set a pattern for almost universal adoption.

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And now a fourth epoch, a fourth period of progression as important as those preceding it, is soon to be inaugurated.

The Cadillac is about to endow the motor car with:-

A new element of efficiency A new quality of luxury A new source of economy

The Cadillac Company is not, as you know, given to false premises or to false promises.

This new development, like its predecessors, is destined to influence the trend of the entire industry.

Public endorsement of Cadillac development has always been more emphatic than our own claims or assertions concerning that development.

It will be so in this instance. Your recognition of these new advantages will be immediate.

Our next announcement will contain particulars.

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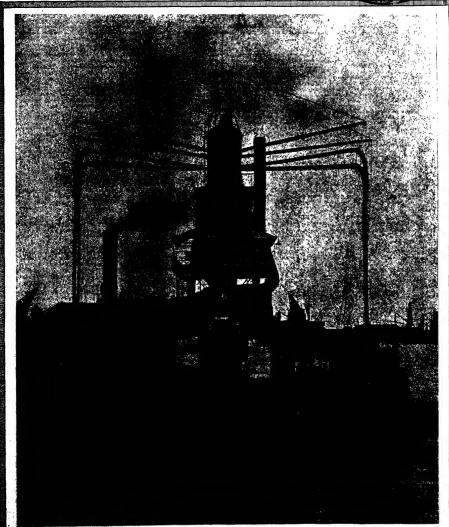
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THE WEEKLY JOURNAL OF PRACTICAL INFORMATION

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**NEW YORK, JULY 19, 1913** 



## SCIENTIFIC AMERICAN

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The follows always gind to receive for examination illustrated articles in antipocts of limet; interest. If the photographs are simply, the articles during, and the facts outledner, the contributions will receive aspecial attention. Accepted articles will be paid for at regular space rates

The purpose of this journal is to record accurately, simply, and interestingly, the world's progress in sci tific knowledge and industrial achievement.

#### Government Valuation of Railroads

IIE ruiing of the Supreme Court in the Minn sota rate case, which establishes the right of the States, where there is no Federal intervention, to regulate califord rates within their own borders, has aroused an inevitable fear among the investors and manners of our railroad systems that great injustice may be wrought in certain directions to the investors, and that the further development of our transportation facilities may be greatly retarded if not practically

Take, for instance, the ruling of the Supreme Court that the value of the right-of-way shall be determined by the current market value of similar land in its -a raling which it applied on hard-and-fast lines cannot fail to work very great injustice. Any one who has been concerned in the construction of new rullroads is well aware that the owners of binds through which the projected line is being inld are upt through which the projected line is being full are uple to ask exorbitant prices for the property that is re-quired for right of way, leaving to the milroad the choice of paying the price or resorting to the delay and expense of condemuntion findings approved by the court

We are well aware that in the building of ploneer railroads, cases have occurred where the desire of the public to obtain the advantages of railroad transports tion has led to an offer of a free right-of-way, should the rollroad be built, but we believe that these cases are comparatively rare; certainly liberality of this kind is not conspicuous in the inter development of existing railronds, particularly in the more populous parts of the United States It is evident that if valuations are to be made in strict conformity to this ruling of the Supreme Court, a grave injustice may be done the investor and the attitude of the Government may become nlmost contisentory in character.

Furthermore, we fall to understand on what basis f inw or equity the court should have ruled that, in estimating the value of right-of way, the interest charges, cost of acquisition and various contingencies should be excluded. Particularly in the case of some of the recently built and extremely costly roads, it can be proved that these expenses are very real and of large amount ('apital is proverbidly timid, and we can conceive of no conditions that would discourage the investor more effectually than the realization of the fact that at some subsequent day, in valuing the pr erty covered by his investment, the Government might se to recognize the large sums of money which had to be invested in excess of land values in the immedi-

in its rolling on the question of depreciation of values, the decision of the Supreme Court runs counter to well-established accounting practice, which has been to charge repairs and renewals to income and not to capital; and it seems to be opposed furthermore to the previous ratings of the Interstate Commerce Commission common consent, deprenation has been considered a liability of the stockholder, to be provided for from reserve funds and current earnings cortoinly it has never been regarded as a wastage of rapital. One of One of never neen regarract as a wasage or separation on the ladge railroad men, commenting on the ladgester of this ruling, quoics, once more, the familiar illustration of the ferryboal, which represents an lurest ment, say, of \$20,000 in a craft which having a life of 20) years is entitled to a return of 4 per cent annually for that period, and also operating expenses and un

amount each year which, in the aggregate, with inter est, will amortize the investment at the end of the twenty years. According to the ruling of the Supreme enth year the owner of at the end of the ulnete the ferryboat should be entitled to a return on the depreciated value of the boat only, or say \$1,000, instead of the full investment.

A savings bank investment would be better than this Some day, in a more remote future than its advo cates would have us believe, Government ownership of railways may receive national approval he made the subject of an net of Congress speak of the remote future, because we believe that the purification of our political life, of which there are araging signs, has not yet proceeded to the point hich our great and costly rallway system can be sufely intrusted to the tender mercles of multibul at pointees. A question of such vast importance us that of Government control of the railroads should be upprouched in a most conservative spirit, and with a keen sense of the high morni obligation of the Governmen to act in a fair and broad-minded spirit in the appruisal and purchase of these vast properties

#### A Word of Warning

THE daily press states that the British Navy has committed itself to the policy of oil fuel to the exclusion of coal for ships of all classes and sizes; also, the daily press and certain engineering ke it apparent that the l'uite the design of its latest buttleships is providing for all

It is inconceivable that Great Britain, owning no extensive oil fields, should commit herself irrevocubly to this poincy, and it is not believed that the United States Navy has so committed itself. We believe, rather, that the United States Navy desires simply to experiment in oil burning, and that its action in the case of three or four most recent ships is not to be regard as a precedent or as a fixed policy. This belief is insed well known fact that while the United State is in a better position as to a supply of oil fuel than is Great Britain, still the Government controls ve little oil-bearing land of known value. The opinio expressed by some experts as to the total known and probable supply of oil is that it scarcely equals five per cent of the total known and probable supply of coal ulso to be remarked that the oil supply is and controlled largely, if not exclusively, by well night uli powerful trusts, who are able to manipulate the prives to suit their convenience, or to withhold the supply absolutely if they see th

e records of all prices show that, whereas fue could be had at about 214 cents a gallon three or four years ago, it now costs from 4½ cents to 4½ cents per gallon. These prices may be accounted for by the fact that at the first mentioned date there had already developed a huge demand for gasoline, naphthas and other lighter fractions, so that the residual (about 50 per cent of the crude oil) represented a by-product for which there was no very great demand. Under these circumstances, the oil interests did everything humaniy possible to encourage and develop the advantages of burning oil for fuel, both in bind and marine ins Their arguments were that off burners required nttendance, less space for stowage, no handling of se, a quicker response to stemming denumes and that the fuel was actually cheaper than coal. These very attractive arguments woo the day and caus many new plants to be equipped for oil burning and any old plants to be converted from coal burning to oll burning

The action of the Standard Oil Company and its sui sidisty companies in the fall of 1912, by which they d to renew contracts with large customers failed to deliver the remired amounts under the their existing contracts, shows conclusively that the demand for crude oil and residual oil as fuel is now apace with the demand for the lighter fractions, so that the future of the oil interests will be to refine only a sufficlent amount of oil to so supply the demand for gas-line and naphthas us to keep the price of these products at the highest possible level. There will necessarily an ever increasing shortage to the supply of fuel oil, both residual and crude, so that we may expect a continual increasing price on this product. In fact, duce a horse-power by burning oil in the furnace of steam bollers than it does by burning coal, and the end is not yet in sight.

It is believed that the United States Navy should build its capital ships primarily as coal burners, providing oil stowage simply as an adjunct. The co availability of fuel are the only questions that need be considered, so far as the Navy is concerned, since the complement of a war vessel includes a sufficient number of men to handle the fuel and the refu having a supply of fuel oil to be used as an auxiliary rests in the fact that the limit to high speed steaming

is the failure of the personnel to get the coal to the is the failure of the personnel to get the coal 16 the furnaces. Hence, it is very desirable that the crews of vessels have sufficient experience in oil burning, so that in an engagement or chase at high speed, after the crew has become exhausted in fring with coal, the use of oil may be resorted to and the personne

the did not may be resident to continue at high speed.

It seems, therefore, that capital ships should not be designed us oil hurners, since a ship so designed cannot go to coal burning without a complete re ment of firerooms, boliers and furnaces. On the other hand, a ship designed primarily as a coal burner can use oil as an auxiliary without requiring any structural

#### Interstate Commerce Commission on the Stamford Wreck

TE larve before us the report of the Interstate Commerce Commission on the rear col-ilsion at Stamford, Conn., on June 12th, in which six imssengers were killed and twenty injured. The findings are based upon an impartial review of the facts as brought out in evidence and they will com-niend themselves to every one who has made an intellint study of the question.

Rear collisions are common enough—sadly too mon-on American railroads; and it may be asked why we select this particular collision for special comm-We do so for the reasons that the circumstances of the wreck are unusual and that they teach some valuable lessons which are summarised in the report

Renr collisions are duo generally to disregard of, or luability to see signals, or to disobedience to train orders. The present collision took place in day light, when the conditions for vision were good, the signals were properly set, and the engineer was doing the best ew how to obey the signals and avoid collision

We are entirely in agreement with the con of the report that the engineer did not have the special experience and instruction required for the operation of such a train. It takes judgment and experience to able the engineer of a heavy passenger train running sixty miles an hour to determine just when and how to apply his brakes in order to stop within a determtned distance. In such experience the engineer of this train was totally tacking. Work as a fireman, or un engineer handling freight and even slow pas trains, would not give him the necessary experience in this connection reference is made in the report to the testimony of the airbruke expert of the Pennsyl vania Railroad, who said that if it had been found necessary to send such an inexperienced man out on ch a train, a traveling engineer, or a road foreman of engines, would have been assigned to ride with him

The report lays stress upon the fact that when this engineer on his first trin in charge of a first-class passenger train, ran by a station and reported that the error was due to the brakes being out of order, no one in authority seems to have seen any necessity for a test, either of the man or the brakes, before he was again sent out on the same line of service We must confess that it is simply amazing that the first run of a new and inexperienced man with an important train not the subject of careful supervision, and that his fulture to properly brake his train, and the reason he assigned for his faiture, should have been overlooked by the company. Such carelessness justifies the re-port in stating that something is "out of gear" on a ratiroad where high-class trains may be given over to an uninstructed engineman

With regard to the condition of the equipment, the statement of the engineer as to something being wrong seems to be verified by the evidence of an expert from the Lackswanns road, who stated positively the, a train in the condition in which this train was found at the time of test (subsequently made) would not have been permitted to leave the terminal of his road in fast passenger train service. The Commission finds that the rullroad has no proper system of checking work reports, so as to determine whether or not the defects reported on locomotives are actually repaired. It seems incredible that such laxity could be possible on a modern first-class railroad. It was an invitation to such disaster as occurred.

The whole system of swiftly flying and extremely trains is safe from collision as far as the equipment is concerned, only if the Westinghouse air-brake is in perfect condition. This fine piece of mechanism, one of the most brilliant and successful inventions of the age, will do its work effectively, only if it is maintained in first-class condition. But like many another successful invention, it requires a thorough system of inspection and maintenance, and it is well understood that careless and too infrequent inspe ing may rob the air-brake of a great part of its effective braking power. On any well organized road, any report from an engineman of the elightest defect in the brakes would receive immediate attention

#### Engineering

Proposed Tunnel Bensath the Selent.—It is proposed to haild, an electrically operated and way connecting the left of Wight with the main land. The length of the line will be some four miles, and the route will be in a direct line between Stokes Bay on the maintain and Ryde on the Island, the crossing lying a little to the east at the point where passengers for London dissembarfs from the German steamers. The total estimated cost is \$3,750.

Panama Casal Excavation in May.—The total execution for May, at the Panama Canal, of 2,779,532 cutic yards brings the grand total of canal excavation for the first time beyond the 200,000,000 cubic-yard mark. There then remained to be excessed 17,401,167 online yards. The total for the month is made up largely of dry excavation in taking out the Culebra sides and of wet excavation representing the work of the dredges at the two sea-feril entrances to the canal.

Selve This Problem.—The largest transatiantic line now under construction will present to a head wind a cross-sectional area above water, including smoke-stacks, masts, etc., of about 9,500 square feet. If the ship were steaming at a reduced speed of 15 knots against a head wind of 65 miles velocity, how much horse-power would be necessary to overcome the wind pressures alone? We submit this problem to our readers.

A Diesel-eagined Ship for American Service.—The placing of the "Hagen," which is driven by Diesel eagines, in service from Port Arthur to Kingston and Toronto is of interest to the engineering world because this is the first large Diesel-engined ship to enter the American service exclusively. The "Hagen" is driven by an 850 horse-power Carels-Diesel, two-cycle marine engine. The ship made the Atlantic passage in 17 days, 22 hours, developing 800 horse-power at 97 revolutions and using three and one half tons of fuel per day. An excellent feature of the engine is the maneuvering shility, as shown in the builders' trial, when the vessel made 63 maneuvers in 41 minutes, reversing from full speed absend to full speed satern, qualities which were sagin demonstrated at Montreal, when the chaip was maneuvering through the looks in the canal.

One Way to Prevent Fire Losses. "Revidents in New York will remember the campaign of education which took place last year under the direction of Fire Commissioner Johnson. The movement took the form of a series of photographs of rooms, houses, and apartments in which there was practically no furniture whatsoever, but upon within policies had been issued, and it was intended to point the noral that the indiscriminate issuance of policies made the firebug's hudness a most profitable one. The greater cance exercised in the first sur nonths of the present year by the fire Insurance companies has been mainly responsible for a reduction, during this period, in the total fire loss, of \$2,382,685. The Commissioner estimates that the saving in wear and tear on the department apparatus due to a reduction of 1,850 fires has brought an additional saving of \$125,000 to the lety.

Excellent Sanitary Conditions at Panama.—That the Isthmus of Panama continues to present sanitary and health conditions comparable to those of the average city in the United States is shown by the report of the Department of Sanitation for the month of May, during which the annual average death rate among employees per thousand reschole the low figure of 7.63, of which 5.42 were due directly to figure of 7.63, of which 5.42 were due directly to figure of 7.63, of which 5.42 were due directly to figure of 7.63. As a supply of the control of the sanitation of the supply of the property of the control of the supply of the property of

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#### Science

The Improved Telegraphona.—A new form of Poulson's elegraphone has been patented in which a thin wire of tungsten steel is made to run rapidly between the poles of a small electro magnet in the receiving circuit of the telephone. In order to magnify the sounds a Brown telephone relay may be employed.

The Aerological Observatory in Teneriffe, recently catabilished under the auspices of the International Commission for Scientific Aeronautics, has been taken over hy the Spanish government and placed under the direction of Sedior Juan Garcia de Lomas Lobaton. Additional stations are to be established at Lower levels in the island.

Changes in the Map of Africa—The territory in northern Africa, recently conquered by Italy from Turkey, has been divided into two distinct colonies, viz., Tripolitams and Circasios, with eapitals at Tripoli and Bengas, respectively. A governor for each colony is to be appointed by the King of Italy upon the joint recommendation of the ministers of Colonies and of War.

Electrification Associated with Dust-clouds.—Prof. W. A. Douglas Rudge publishes in the Philosophical Magnesian the results of calaborate investigation showing that nearly all kinds of finely divided material when blown into a cloud by a current of air give rise to electrical charges upon the dust and upon the air. The nature of the charges upon the dust and upon the dark and upon the charges resident upon the dust particles depends upon the charges in the charges in the material of the charges in the material of the material of the material control of the material or the material of the material of

The Ninth International Congress of Hydrology, Climatology and Goology will be held at Madrid, October 15th to 22nd, 1013, under the patronace of II.M. the King of Spain. An international colhibition compressing paperprishe selectific material will be hold in connection with the congress. The congresses of this series deal mainly with the medical aspects of the series of the se

Experiments with Ripples.—At the recent conversations of the Royal Society, Porf. L. R. Wilberforceshowed how ripples may be produced on a water surface by a vibrating dipper and projected by intermittent light so as to appear stroboscopically in slow motion. A phonic whold drove a slotted disk which produced the internittence, the motion being transmitted by fluid fraction, whereby a very uniform rotation was obtained in

Prof. Rockwood Dead.—Dr. Charles Greene Rockwood, Jr., Professor Emeritus of Mathemation at Princeton since 1905, died on July 2nd. Prof Rockwood was born in New York in 1842, the son of Charles Ca. and Sarah Smith Rockwood. He was graduated from Yale in 1864, receiving his Ph.D. degree them 1866. He received the degree of A.M. fram Yale in 1867, from Bowdoin College in 1869 and frum Princeton in 1896.

A Novelty Among Agricultural Experiment Station Bulletian has just been suoud by the station of the University of Wyoming at Learnine, outstied "The Identification of the Woody Aster" (Stutien in No. 97, April, 1913). The bulletin in prunted on a sheet of earthward, folided once to make four pages. The first, (cover) page and the hast page contain photographs of the plant in question, which is poisonous and has caused the death of thousands of they in Wyoming; the second page contains a non-technical description; while on the third page is mounted, in behaviour style, an actual specimen of the sets, in blosharium style, an actual specimen of the sets, in blosharium style, an actual specimen of the sets, in blosharium style, an actual specimen of the sets, in blosharium style, an actual specimen of the sets, in blosharium style and the sets of the set of the

"The Barocyclonometer for Use In the North Atlantic" is the title of a pamphlet by Rev. José Algué, S. J. which has puts been published by the Philippine Weather Bureau at Manila. An account of this instrument in its original form, as used for many years past by mariners in the Par Reat for the purpose of defermining the proximity, direction and movement of typhoons, was published in the Schrittine American of October 10th, 1912, p. 328. It has been materially modified by its inventor for use on the Atlantic.

Measuring the Stress Distribution in Transparent Makerlain.—Prof. & O. Coke has devised an apparatus for measuring the principal stresses at any point in a plate subjected to plane stress. This he accomplishes by measuring their sum and difference separately. The sum proportional to the change of thickness of the plate, and is measured at any section by a special form of extensementer reading to half a millionth of an inch. The difference at the same section is obtained from observations of the soulce bands shown in polarized light.

Lindenberg Observatory, the premier aerological institution of Europe, on December 31st, 1912, completed ten
years of daily upper-air observations with kites and captive ballooms. In spite of overy variety of unfavorable
weather, including furious gales, heavy fog, severe thunderstorms, lee deposits on the kite-wires, etc., observations were not omitted on a single day of that period, and
the total number of assents amounted to 5,659. No other
observatory in the world approaches this record. During
the first two of these years the ascents were made at
Tegel, the original site of the observatory. Besidest the
routine daily observations above mentioned numerous
ascents of pilot-balloons and sounding-balloons have been
made.

#### Aeronautics

The First Aeronautical Scholarship has just been won by a student at St. John's elementary school, Ealing, England. The scholarship is the gift of Mr. Grabame-White, and entitles the holder to three years' seromautical training at Hendon.

Zespells to Attempt Transatlantle Flight.—Count von Zespeln is bulled in largest dirigible with a view to crossing the Atlantic to the United States in the late summer. He expects to make the trip from thirty to sixty hours' time. German warships are to be distributed along the course to assist the airship in case it is obliged to descend.

Supporting Wheels for Aeroplanes.—Harry A. Ormeof Wesley Heights, D. C., has secured a patent, No. 1,063,386, for an aeroplane in which the wheels are mounted in frames which are protected to the plane of the aeroplane so that they can swing outwardly in opposite directions, means being provided for elevating the wheel frames ontwardly and laterally in the operation of the apparatus.

Equilibrium Device for Flying Machines.—Frederick William Dufwa of Mexico, has patented No. 1,005,033, an improvement in thing machines in which a rudder is mounted to swing sidewise and a swinging car is connected by a flexible connection with the rudder so that a side dip or invitination of the machine will automatically swing the rudder to re-ostablish the equilibrium.

An Aeroplane Improvement,—Halvor Olsen Elane of Sau Dego, Cul., has patented an acroplane in which there is provided in connection with a frame, a horizontal adjustable plane which may be adjusted by means of spaced vertical planes which may be adjusted for bodily movement in a lateral direction by the air and are operatively connected with the adjustable horizontal plane. The patent is No. 1,1662,772.

norrountal piane. The patent is No. 1,062,772.

New Steering Gears for Aeroplanes. 1-n patent No. 1,062,055, to Rene Tampier of Paris, France, is shown a steering mechanism for aeroplanes in which the rudder is capable of movement about a vertical axis and about an orbique axis which is strelf movement, and about an oblique axis which is strelf movement being controlled in its several movements by means of two liand wheels and bearing mounted at three transpolarly arranged points so it can be actuated as above described.

An Aeroplane Flight from England to India will, says the Landon Times, be attempted next October by Mr G M Dyott, who is now making cross-country flights in South America, the undertaking being, however, contingent upon the completion of a guarantee fund, which now amounts to about 11,000 The proposed route is by way of France, Sielly, Alexandria. Curo, Khartun, Suakin, Aden, and Karseln At the end of the flight it is proposed to present the aeroplane to the Government of India.

No Royalties on Wright Machines, it does not seem to be generally known that the Wright Company no longer charges royalty for the use of their machines for childition flying. As a matter of fact no flying royalties have been charged since January 1st, 1913. The Wright Company has deceiled, because of the greater competition in the exhibition business this year, to give their patrons still greater advantage by discontinuing the royalty charge for exhibition work. This means that the purchaser of a Wright machine will have the free and unrestreted use of the machine.

A Texas Flying Machine Patent—In patent No 1,036,772, Frank M. Bell of El Paso, Texas, shows a flying machine of hiphane form with two engines located below the lower plane and two concentre propeller shafts seak equipped with a propeller and located between the two planes with gearing from the organism of the propeller shafts and propeller shafts are propeller shafts and convergence of the control of the co

Pilot Statistics. "The International Aeronautic Foderation has recoulty published its animal bulletin, and it contains a lot of sevenants in all countries who are regularly entered. Up to the ord of last year the number of sevenance pulots is as follows: France, 96, Great Britain, 370, Gremany, 355, United States, 1931, Italy, 1989; Russai, 192, Austria, 84, Belgium, 89, Switzer-land, 27, Holland, 28, Argentina, 15, Spain, 15; Sweeden, 10, etc. Piolot of spherical bullours are as follows: Germany, 900; France, 294; Austria, 80; Italy, 07, Belgium, 85; United States, 42, Great Britain, 25, Switzer-land, 30; Spain, 30, Holland, 17, Sweden, 17, Argenina, 13, etc. As to pilots of surlsips, the number its Austria, 24, France, 23, Germany, 22; Italy, 13; Great Britain, 12, United States, 3, etc.

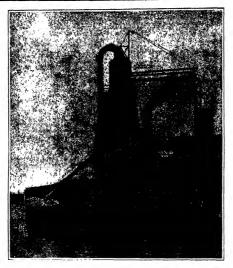
#### A Floating Pneumatic Elevating and Grain Discharging Plant

By Frederick C. Coleman

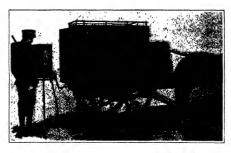
A N interesting floating imenmatic eletion has just recently been put into service at Emden, the rapidly-developing German port on the North Sea at the mouth of the river Ems. The elevator, which was built by Messrs Gebruder Seek of Dresden for the Elevator Gesellschaft of Emden, is illustrated in the photographs and consists of a floating iron pontoon, in which there are divisions for boiler and engine installations, together with living, engine institutions, together with every kitchen and invatory accommodation for the stuff, and anale storage room for materials. The machinery installation in the pontoon consists of one compound vertical steam engine, connected with the necessary air pumps of vertical type to which they are direct coupled. The speed of the steam engine can be varied even when running by means of a hand wheel and regulator on the shuft. In the same room as the steam engine for driving the pumps are the condensation apparatus, the Leuz and bother feed pumps and a special engine for the production of light and power, which is also of vertical type and coupled direct. There is also a third steam engine with a beit drive for a small dynamo to produce electric energy for The engines, pumps and power purposes. The engines, pumps and gears receive their steam from the botter, gents receive their steam from lie holter, arranged close to the enclue-room, and work at a pressure of 12 atmospheres. To the left and the right of the holter room are the root stores and the water tank from which the holters are fed. Above the engine room is the from mast which carries the pneumatic transport apparatus and weighlug machines As n be gathered from our illustrations, n por be gathered from our illustrations, in por-tion of the must is covered with sheet iron and is provided with staircase, plat-form, whallows, doors, etc., and the whole is well fixed to the floating pontoon. On the top of the tower, at the platform level, are placed the receiver and discharger of the transport installation, and to these are connected four carrying tubes which are made mavable both vertically and horisontally, and are fitted at the ends with suction nozzles so that the amount of air suction mozzies so that the amount of a carried up with the grain can be regulated to a nicety. Pipes are then led from the receiver to the pumps and air vessel, which are fixed on the side of the tower To meet delays which might occur dur-

ing weighing operations or by disturb-ances in the air lock, there are provided inlet valves as well as automatic safety valves, arranged in the air tubing and air chamber, which come lute operation when the normal working pressure is exce In the olr clumber is also an arrange ment to prevent grain being carried over into the same To prevent any dust entering these there is arranged in the interior of the receiver and discharger patent dust-collecting arrangement. This separates the dust from the grain, and allows them to mix only after the lutter has passed through the vacuum chambe of the receiver. A special advantage of this arrangement is that complicated cloth or water filters are avoided, and thus there is a great saving of space and labor. The whole tostaliation is very simple and entirely automatic. Below the receiver is the discharging device, which is adjustable and driven by an electric motor The current is regulated by a switchgear, set at a specified resistance, and if this is exceeded (which happens under abnormal conditions) the power is automatic ally switched off so that both discharger Beneath the and motor stop working discharging device an iron hopper is ar ranged with a double silde, from which the grain is fed into an automatic weigh er Thence the grain is brought into an other hopper and then by means of tele scopic tubing it is discharged into small

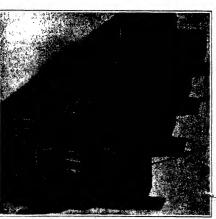
The plant is arranged to take a sack ing machine of a capacity of 50 tons per hour, and will empty steamers and load lighters (in bulk) at the rate of 120 tons



View showing elevation of the floating grain discharger operating in the pneumatic transportation of grain,



Ultra-violet light water aterilization apparatus for army use.



A municipal ultra-violet light installation for the sterilisation drinking water.

in the same time. In all wor living compertments of the elevate led, and the signaling are nmunicating between rking positions are spec

#### Purifying Water by the Action of Ultra-violet Light

By Dr. M. von Recklingh

T to highly important that a good drinkng water shall be free from microbe because many disease germs, such as the bacteria of typhoid, cholera, etc., are transmitted by water. A single person has caused infection to springs with typhoid and thus caused epidemics in which many people died. Hence modern hygienics de mands, first of all, sound drinking water for public distribution as well as for private use. Many springs deliver good wh some water, very low in their microbic contents, particularly in bacterium coli. How can these sources deliver pure water if they are supplied with water from riv-ers or effuents heavily charged with the ers or convents neverly charged with arrefuse of towns and villages? Simply by following the methods of nature. Nature employs two means for purification. The lirst is the action of sun or daylight on the microbes Soating in the water. It the microbes floating in the water. It has long been known that the sun has so strong a bactericidal effect, that rivers are purified some miles below the entrance of city effinent, so that the water contains scarcely more microbes than before entering the city.

fur purifying water, is filtration over nat-ural sand beds, such as river alluvials, thereby mechanically freeling the water of suspended matter and of germs. Until recently only the latter process

has been artificially employed. For nearly eighty years water plants have been provided with sand filter beds so that the water which they deliver is nearly always physically good. In other words, it is free from suspended matter. Bacteriologically, however, the water is not always up to the standard which mod-crn hygienics demands. For instance, Miquel, the famous French water hygienist, demands for water of the very be quality a microhic content not higher than ten per cubic centimeter. And the number of bacterium coli must not exceed ten per thousand cubic centim To obtain such results the first one of the above mentioned natural methods of killing microbes is now practically applied; ing incroces is now practically applied; namely, exposing water to a strong light. The strong bactericidal or ateri-izing action of the sunlight is due to the ultra-violet rays in the solar spectrum. Hence, we must choose a light which is extremely rich in these ultra-violet rays. We must create a miniature "artificial sun." In the quartz mercury vapor lamp, which closely followed the fundamental work done by P. C. Hewitt in illuminati mercury vapor lamps, such a source of ultra-violet rays has been found.

Purification, or sterilluation, of water y ultra-violet rays has become increasingly important within the last three years. The principles which form the basis of the water sterilization by mer-

basis of the water sterilization by mer-cury quarts lamps are as follows: First. Water, being easily penetrated by ultra-violet rays, may be exposed in a thick layer to the rays. But the water

must be free from floating matter.
Usually it must first be filtered.
Second. The apparatus must be so arranged that the ultra-violet rays are produced with a minimum of electric energy; violet ray lamps must have an economical life.

Third. The apparatus must be so con-structed that the maximum amount of ultra-violet light enters the water. In other words, as little light as possible should be lost.

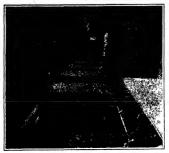
Fourth. The apparatus must be so con

structed that the water passes under influence of the strong light several ti This is effected either by leading the ded an enne in

The Part of the Pa



Projecting mechanism, showing the fingers that make contact through perforations in the film.



Riflemen's counter, with a panel removed to show the recording mechanism; recording lamps at the left.

## Shooting at Moving Pictures



Rear of the steel screen, showing the steel balls that

W ILD game hunting with no game warden about and open season all summer can now be enjoyed by the city-bound hunter. The happy hunting ground is at Coney Island, where moving picture animals in englistic settings examper across the far end of a shooting gallery for the accommodation of aspiring marksmen. The only departure from reclaim is that the animals do not fall dead when shot, but by a very lurgestious mechanism a record is made of the hits, and the scores of the different riches are kept segrately.

Two weeks ago the Scientific American described the moving picture targets used for the training of sharpshooters in the British army, in connection with

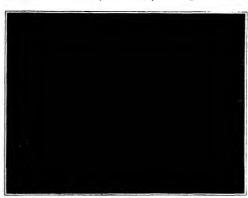
which a sound actuated mechanism isntern for an instant as soon as a abot is fired, so that the result may be determined by noting the tear in the screen. The fundamental in the screen. The fundament difficulty with this system of m ing targets lies in the fact that the animals appear to move, whereas they do not actually move, but are merely seen in different momentarily fixed positions. For instance, an animal which occupies a certain post tion in one picture may in the very next picture occupy a position several inches away. The eye supplies the illusion of moving from one spot to the other, while the picture animal does not actually traver distance. If the rifle is fired when the animal appears to occupy a point intermediate between the two actual positions, it will strike the screen between pictures, and a miss will be recorded. This difficulty has been very successfully overcome in the system illustrated in the accompanying engravings, the inventor of which is Mr. Eliot Keen.

The screen on which the pictures are projected is a steel plate about eight feet square and painted white. At the back of this plate a wooden

gridiero supports small from helis hung on short pieces of chain arranged so that the impact of the builtet on any point on the steel screen will drive a hall away from the plate, extening the chain to cross, two rods, thus closing a break in an electric cirvuit. Only the rods immediately behind the target are energiesd, so that a hit will be electrically recorded if the builtet arises the target. Otherwise the apparatus will solute a miss. One of the accompanying photographs shows the back of the steel screen with the balls attached to it and the rode running across it. The balls are three inches apart. The rode run hortsontally, but every other one is connected with a vertical wire. We may liken the horisontal rode to parallel of latitude and the vertical wire to meridians or lines of inogratide. by which any spec on the screen may be fixed, just as on a map. Having determined the latitude and longitude of the different points that will be compled by the

the vertical and horizontal lines crossing at these points at the particular moment when they will be traversed by the moving target. This is done by using sets of contact fingers on each side of the film in the projection mechanism and cutting perforations in the film through which various combinations of fingers may make contact to close the circuit of the corresponding parallels and meridians of the serven.

As shown in one of our illustrations there are nine fingers on one side to control the paralicis and nine fingers on the other to control the meridians. These fingers operate in pairs of various combinations to close the circuit of relays which in turn operate to energize



Relay board actuated by the contact fingers and energizing the rods behind the acreen.

the corresponding rods. By using intermediate relays, nine fingers are enough to control three or four times as many rods.

In preparing a film it is thrown up by means of a weak light upon a chart which shows the location of the wires and the balls of the large target board. The operator looking at the projected image of the first because of the first season of the first because the size of the first season of the fi

fingers us they drop through the perforations of the succeeding picture on the film. The 'vlui' spot on the animal never purses, on of the sensitive area in the serven. It is not to be supposed that a builet must actually strike the steed cartion at the very notion behind which the bull is resting. There is no spot on the screen that is dead. If a bullet should strike mulway between two builts both of them would be thrown outward, making contact with their respective roles. This between two successive positions of the animal, and through which by the Illusion of the kinemiorarph the animal appears actually to move, the screen is sensitive, and simple in bullet strike are intermediate spot, a bit

would be recorded. In other words, there is never a time when the libusion makes it impossible to score a

The lats and misses of each marksman are recorded by a series of lamps located before and above The circuit to these lamps is closed through his own gun trical connections to the different guns are made through a light flexible cord which does not interfere in the least with the shooting. The contact is made at the hummer when the gun is cocked and broken when the gun is fired. An electrically operated ratchet device steps n brush from the terminal of one lump to the terminal on the next lamp to the terminal on the next lamp circuit. A thining device is used to operate a circuit breaker. Every rifle is connected to its own "stepper" and scoring lamp. When the gun is fired, the thining device closes the circuit connecting the par-ticular gun with the steel target contacts for a fraction of a second If the shot is a hit during this interval an impulse lights the lamp by throwing a switch. If the shot is a miss the timer cuts the connection after the proper interval and the lump stays dark. The gan cocked

for the next shot steps the brush to the next lump and so on. Any number of rifles can be used, for the interval required for an impulse to reach the imp of each gun is hardly appreciable.

Automobiles of the Paris Fire Department.—The Paris fire department intools to double the equoetty afforded by its present automobile fire engines, by the use of affected unknowled the pumps, which will be of a lighter design than the ones already in use. The new engines will carry six men instead of fifteen. On the wagon truck is mounted a 100-gallon tank so as to the wagon truck is mounted a 100-gallon tank so as to the afford an immediate water supply for the hose so that a stream can be put on the fire at ones, while the consection is being made with the fire plug. This type of light engine is especially insteaded for fighting moderate-stand first during the daytime. The number of automobiles used by the chief firemen is also to be increased.

#### Wireless and Sound Signals as Aids to Navigation

#### By Louis E. Browne

EXPERIMENTS recently conducted on board the stematic states stematily "Woodington," in the stematic of the purpose of demonstrating the practicalities of the purpose of demonstrating the practicalities of detormining distance from a source of simultaneous welf-close telegraphic and sound waves as a means of facilitating mutgation in cogy weather, have been necepted by the Navy Department as concluder proof that this system, in time, can be developed to a likely degree of perfection

in time, can be developed to a min negree of perfection.

The moduling futurely which the experiments were made was very hard, but Nantucket Should light-meaning the could be duals seen for about the unities. The barronpeter stood at 30.11 and the sent was entire. Startly lightmear the light-shift, a contine was steered to the westward for a distance of eight indice, and then, turning
to the southward and proceeding cost, the light-ship
wars passed on the post beam at a distance of 3.50 are
vards. Standing on for eight notes more and then
turning to the northward, a northwesterily course was
pursued passing the light-ship on the port beam at a
distance of 1000 vards. Then, turning southward, the
Washington' approached and passed near the light-

distance or root varias Trien, throngs someward, the Washington' approached and passed near the lightship on a southwesterly course at the close of the observations

The track of the 'Washington' in realism to the lightship is shown on the necompanying drawing by a continuous laked, him, which was determined by the rangetinder method, compass readings, and distances run, after making careful allowance for the third current thal was found to be setting generally to the north word during the experiments. a Hack chronometer, and the times of arrival of those from the submarine hell by a stop watch. The same observer noted both the wireless tick and the submarine-hell signal. For the velocity of sound in air at temperature of 64% dee, Fahr. a speed of 1,126 feet per second was used, and Dording's determination of the velocity of sound in water as 4,784 feet per second at 66 deg Fahr, was adopted

Interval of time between the receipt of the wireless and bell signals multiplied by the velocity of sound through the water will give the distance of the ship from the spot from which the signals are sent within three of four hundred feet.

For Instance:
The between wireless and bell 4 seconds
Velocity of sound in water 4,794 feet per second

librance of ship from bell. . 19,176 feet

Further tests are to be conducted by the Navy regarding the perfecting of the submarine signaling system. Furchar mitions have done much more to develop this system of signaling than has the United States It has been reported to the Department of Naval Intelligence that some of the big German ships can find their was that the harbor at Hamburg and up the river by means of the submarine bell and fog whistie checked up to the wireless.

#### The Competition for the New York, New Haven and Hartford Railroad Company's Automatic Stop

CHARLES S MELLEN'S offer of \$10,000 for the best automatic stopping and speed control device which would safely arrest trains disregarding fixed

some of the conditions required by steam suffice lines one of these being the ability of the device to work under all weather conditions and to be impervious to

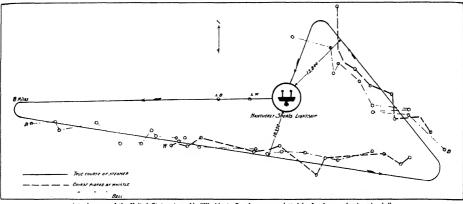
July 10, 181

Inasmuch as the approval of the Interstate Commerce Commission would be necessary before the New Haven would feel justified in putting a stopping device in regular operation, the requirements laid down by the Train Control Board have been adopted as well as sight additional ones made necessary by the peculiar conditions of the New Haven Illess.

Of the 704 devices of which plans and models have been submitted thus far, it is aunounced that not one has met condition No. 1, which reads: "The apparatus should be so constructed that the removal or failure of any essential part would cause the display of a stop signal and the application of the train brakes, and if electric circuits are employed, they should be so designated that the occurrence of a break, cross, or grunnd, or a failure of the source of energy in any of the circuits, should cause the display of a stop signal and the application of the train brakes."

A few of the devices already submitted might be perfected, it is said, so as to meet this requirement, and no dusht this will be done. A very large percentage of the devices have failed to embody any speed control feature, also one of the conditions, this being a provision that a train at a speed less than a pre-determined number of miles per hour might peas the automatic stopping device without application of the brakes. Also many have failed to meet the requirement that the device should work under snow, ice, sleet or freesing conditions.

All sorts of ideas are represented in the models and plans now in possession of Engineer Morrison. Most



Actual course of the United States steamship "Washington" and course as plotted by fog horn and submarine bell.

Signals from the light-ship consisted of shaultimeous signals from the whreless-clearing inpuratus and the submarfine-bell at the linearity when the steam for whitels give a blant. At intervals of one unlimite the maximum hardwal at while the third cleakes attached to the whistle permitted it to not a sound blant was blown from the rogsvibistic. At the instant the whilethelies, the wireless operation thished a tick, of two or three seconds diaution and the rathe of the stifking mechanism of the submarfine bell was tripped. This was necomplished with absolute accurace, for it was exhaustively tested by the colneidence of all three signius when the observers were close to the flattaship.

The results of the expediments are shown on the drawing. The lock of the observing vessed with respect to the lightship, as computed from the distance traveled by sound in water, between the time of the arrival of the Herrian waves and the signals to on the submarine bell signal fixed to the bottom of the lightship, are connected by dots and dushes, while the bott, as deternimed by the distance traveled by sound in all, between the times of arrival of the Herrian waves and the signals from the steam for whistle, are connected by

A remarkable feature of the tests was limit his sounds from the steam log-whilste were best after steaming half a mile to the westward of the likhriship, at the beginning of the experiments but in the run the eastward they were carried all the was through word the submarine bell signals were lost but four times. The times of arrival of the wireless signals and the steam for white the grants were lost but four times.

signals, expired on July 1st. On that date 2,816 persons in all had entered the competition. The applicants represent every country, including China, Japan, and Australia

While a total of 2.410 persons have responded to the original offer and may be said to have a tered the competition, only 704 of the applicants thus far have substitute plants in reply to the circular sent to such as plicant giving the conditions and requirements of the competition. This recent is to be acceptable a device must be adopted for general use by either the New Intellectual President and Presid

The amount of lallor involved in President Melleu's ofter may be estimated from the fact that C. H Morrison, chief signal engineer of the New Haven, who has been placed in charge of the competition, up to July lot laid written 4.082 letters, and 1,483 copies of patcuts but been clustual from the Metantic Office.

cuts had been obtained from the Patent Office. The of the reasons underlying Freedest Mellou's offer was the fact that at the present time there is no automatic stopping device in requiral operation on any of the steam surface roads of this country, though some roads are conducting experimental rests. The New Haven road, however, is the only road which has thus far offered a reward to inventors for such a device. The stopping devices operated on some elevated and subway lines, notably in the New York subway, while effective on such lines, have not been designed to meet

of them show that the inventors, while intent on rul alling some of the eighteen requirements specified in the circular, have totally disregarded others, particuiarly that one providing that the failure of the device to work, such as might be caused, for instance, by a person tampering with it, would of itself cause it to stop the Irais

Despite the fact that not all of the requirements have been met, the railroad will proceed at once to test the more meritorious of the devices submitted. These tests will begin the middle of this mouth, and will take place on the western division between Hartford and Newlagian. The two nutuants stap systems coming the near-to oil of the requirements will be tested first. One is the invention of Gene Webb, and is the property of the International Signal Company. The other is the luvention of un engineer of the Union Switch and Signal Company. The state of the International Signal Company. The other is the luvention of un engineer of the Union Switch and Signal Company. The other is the luvention of un engineer of the Union Switch and Signal Company. These will be bested out from a third rail. The tests of these and other systems submitted may take a year, but it is necessary to see how they meet all weather conditions. A bosomotive will be equipped with each device and operated over the track selected and on which the stop has been installed.

Obviously so award can be made until the expiration of the year 1915, as until then every invarior who has entered the competition has a chance so to perfect his device as to make it acceptable. The reward, under the conditions announced, is to be paid on the order of the Interactic Commerce Commission, the Masseckusesta Railroad Commission and the Connecticut Public Utilities Commission.

#### Correspondence

ore are not responsible for statements made in the correspondence column. Anonymous comtions cannot be considered, but the names of correspondents will be withheld when so desired I

#### Lifeboats Which Can Be Launched on Either Beam

To the Editor of the SCIENTIFIC AMERICAN.

With reference to the article appearing under the allow me to correct the statement that the last, allow me to correct the statement that the Flushing steamers are owned by the Netherland State Railways. These steamers are owned and operated by a separate corporation, namely, the Zeeland Steamship Company. are owned and

At the same time I would like to draw your assention to the fact that the devices by which lifeboats can be launched from either side of the vessel, has not only been installed on the night steamers of the Pitukhing line, as day steamers of this company, running between Queenboro and Flushing, have for the control of th At the same time I would like to draw your atten running tesseen the recommendation of the saving device has been introduced on the Flushing steamers, namely, an accumulator bettery, situated near the writeless room far above the water level. In case the ship's dynamo should be stopped for any reason, its work is taken up automatically by this accumulator battery, which develops enough power to keep the wireless apparatus in opegation for about eight hours after the dynamo stops. New York city. C. Baxker, General Agent.

#### The Inventor and Price Fixing

To the Editor of the SCIENTIFIC AMERICAN:

I have read with very much gratification the article n "Benefits of Our Patent System—the Difference tween Monopoly and Patent Protection," B. Fay of Cleveland. It seems to me that no one could read this article without getting a very clear idea of the difference between the illegal monopoly and the monopoly granted by the patent system. The article excellently supplements the vindication of the patent monopoly set out in the minerity report accompany-

ng the Oldneid out
Referring to the recent decision of the Supreme
Court of the United States declaring that the patentee
has no right to control the price of the patented article has no right to control the price of the patented article after the ownership has passed from him, it occurs to me that there is a misconception as to what actually takes place in the sale of the patented article where the patentee fixes the final selling price. In such case, the seller retaining the right to fix the price, as has been done in safety razors and other things, it is clear to my mind that the patentise or seller has not parted with his complete title in the article. He retains enough of title in the vended articles to entitle him to say at

what price the articles shall be sold The transaction is very much akin to conditional ales, well recognized in common law, where the vendor tains title in the articles of merchandise until he has fully received his pay, and yet for all practical purposes, so far as the vendee or merchant is concerned, he h bought the goods outright, subject, of course, to this remnant of title left to the vendor. If the owner of a patent retains the right to fix the selling price, he is, in a similar manner, retaining a portion of his title that would legally give him the right to dictate the selling

which his goods shall be sold, the value of his monopoly is gone, a fact that has been abundantly preven in the history of many patented articles gotting into the of price cutters, as department stores and the This phase of the case, however, has been so abundantly manifested by much previous discussion that it is not necessary for me to suggest anything

scent decision is final, it seems to worth while for those interested in patent matters to work for restoration of the right of the patentee to fix the final selling price.

C. W. Dickinson.

#### The Maximum Parcel

To the Editor of the Scientific American: In your number of May 17th, 1913, Mr. Joseph

to tell in house

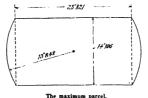
In your number of May 17th, 1913, Mr. Joseph Beeker has an interesting communication on the maximum parcel that can be accepted for transportation under the present Parcels Fost regulations, which prescribe that the sum of the rich and length must not acced 72 inches. Very Blady Mr. Beckar's Interpretation of the regular times agrees with that of the Post Office Department of the Post Office D

ment, but I venture to point out that it is not consistent with the wording of the regulations, which say "in measuring length the greatest dis-tance in a straight line between the two ends of the parcel shall be taken." If we have a rectanguthe parcel shall be taken. If we have a rectangu-lar package and take as its length the perpendicu-lar distance between the planes of the ends, we are using for the length not the "greatest" distance in straight line between two ends, but the a straight line between two ends, but the "least" distance between the two ends. The greatest distance in a straight line between the two ends of a rectangular package is obviously the diagonal of the solid.

In this case the largest rectangular package that can be accepted under the literal wording of the Parcels Post regulations is, using dimensions to three decimal places, 10.286 mehes square and 27.214 juches long on an edge, the diagonal being 30.857 luches. Such a package will contain 2,879

cubic inches only.

The very largest volume that can be accepted for Parcels Post transmission under the regulations be a cylinder with spherical ends, as indicated in the inclosed sketch which gives an axial section of the solid. The diameter of the cylinder will be, to the third decimal place, 14.106 inches, and the length of the side, to the third decimal place, will



he 23.821 inches, the cubical contents being 4,032 19

The problem of the maximum volume was paper, and a right cylinder with plan ends was given as a solution. This solution was open to the same objection pointed out above, namely, that for such a figure the length was not the greatest distance in a straight line between the two ends, but the least distance in a straight line between the two ends D. W. Tarlon,

Naval Constructor, U S.N Washington, D. C.

#### Grant Linton Replies to Mr. Hanna

To the Editor of the SCIENTIFIC AMERICAN Your same of date May 10th is at hand, containing your correspondent's criticism of my plan of aeroplane supporting surface design discussed in my letter of

Mr. Hanna claims that the sustaining force of the wire or eard constitutes of thelf an element in the equilibrium of the forces. This is indeed true, for, besides the one system of forces, namely, weight balanced by the vertical component of the air pressure or lift, there is the horizontal component of the air pressure there is the horizontal component of the air pressure or drift balanced by the sastaning cord, which latter system the writer omitted to mention in order to avoid complexing the problem. Mr. Hanna has confined these two distinct and entirely separato sets of forces Thus, the only appreciative effect the sustaining cord could possibly exert upon the vertical system is that caused by its own weight, which of courses would be negligible

Mr. Hanna challenges my assertion that the air is flowing horizontally at the forward edge of the fabric Is it necessary to mention that when the writer used the term horizontal he did so only to indicate the general direction of the line of flow of the air atream? Whether the direction of flow were horizontal or slightly divergent from the horizontal could not have a detrimental effect npon the proper working of the fabric Again, Mr. Hanna avers that at greater angles of

e than 30 degrees there will be a decrease incidence than 30 exgress those will be a decrease in the absolute lift of the air prossure, but an increase in the absolute drift, instead of a proportionate decrease in each case. Now we have Mr. Hanna's word for it farther down in his letter that "5 degrees is shout the maximum (angle of incidence) now found in efficient acroplanes," so that this fact then precludes the pos-sibility of the exception cited having any offect upon asibility of the plan proposed.

the reasoning of the plan proposed.

Mr. Hanná's confessed ignorance of the truth to my statement that "in both classes of vehicles the best efficiency could only be obtained by altering the length of the oord," is hard to reconcile with his own declara-

tion that "the late A. Cary Smith, by means of a trivance called the reach reef, which enabled the curva-ture of a sail to be varied manually at will, succeeded in substantially increasing the speed of a number of racing yachts." Evidently Mr. Hanna is unaware of the fact that exquisiteness of detail is just as an important matter, and more so in the design of the aeroplane than in the design of the sailing yacht, or that refinement existing models constitute es of itself the chief hope of the student of the heavier-than-air machine.

As an answer to Mr Hanna's contradiction of my statement that "full speed when once attained is as regular as that of the highest types of machinery, ne writer would cite as a particular instance the formance of Vedrines, the winner of the last contest for the Gordon-Bennett Aviation Trophy, at Clearing. Ill, September 9th, commenting upon which Major Samuel Reber says: "The speed at which he (Vedriues) made his fastest lap was 106 3 miles per hour, and that at which he made his slowest was 103.2 miles per hour,

at which no made instruction by the strength of the manning percentage variation in speed made in any lap from his average speed was I 8 percent, or in other words, a speed regulation obtained only in the highest types of automatic machinery." only in the indicate types of anomatic machinery.

As for the reference to reports of tests made on a Zodac hiplane, let the writer inform Mr Hanna that the biplane is by no means acknowledged the most highly specialized type of the heavier-than-air machine, also that though "the ability to vary the speed of horizontal flight within wide limits is a most desirable quality of the aeroplane, this feature (as attained at present) is only a proof of poor design, or at least of mefficient running

As an authority for "the helief in the parabola as only correct basic curve for wing sections," which Mr Hanna takes exception to next, the writer could quote no other than the Montgomery, whom Mr. Bauna mentions so often in his letter. How Mr. Hanna could have put any other construction upon my meaning than one identical with the behef held by the gentleman himself is a mystery to the present writer. Not to further intrude upon valuable space in what would be further intrude upon valuable space in what would be incre reiteration, therefore, the render is referred to the last paragraph of the letter in which the plan was originally proposed, where he will find the final answer to Mr. Hanna

When Mr. Hanna says, "I have often observed a piece of fabric suspended by one edge in a current of air, and I never saw one piece rise to a sufficiently acute angle of medeace for peroplane use without beginning to flap or undulate." he shows clearly that he has failed to grasp even the fundamental principle of the plan. for the undulating of the labric mentioned by him obviously could occur only when the speed of the air is such that the pressure exerted by it upon the fabric is vasily greater than the weight of the fabric itself. This condition is commonly seen when a piece of flexible This condition is commonly seen when a prece or assume fabric (necessarily very light unless loaded) is suspended in a wind of even moderate velocity, and it is quite clear, from his own description, that this is the condition Mr. Danua had in mind whon he made the statement quoted above. Then again Mr. Hunna fulls into a very grave error in assuming that, because the apward component of the an pressure is uniformly distributed over the surface, the total air pressure is likewise. Here he fails to take into consideration the

hkewise. Here he fails to take into consideration the effect of the horizontal or drift component of the pressure. In making a distinction between the two surfaces of the wing. Mr. Planna has introduced an entirely of the wing. Air rianna has introduced an entirely new particular, which for simplicity was omitted by the writer. The "singlo" surface is, of course, a com-promise between the two possible hest efficiencies of upper and hower surfaces; but, in consideration of the fact that, despite its undoubted inefficiency, manacroplanes use this type of wing, the writer felt limiself well within his rights in biniting an explanation of the application of the plan to this type alone. However, if Mr. Hanna really desires an answer to his query, the writer would suggest subjecting the upper and lower surfaces singly to the air flow, and then comparing the forms thus obtained (as regards angle of incidence, etc.) for an adjustment of relative loadings, and then joining the two together in the construction of a rigid plane. This system would have the added advantage of eliminating the modifying influence of the bars of metal objected to by Mr. Hanna, for these of course could be attached on the side of the fabric opposite that being subjected to the action of the air stream

Mr. Hanns has fasted to point out in his letter why an analogy between the action of the sail and the proed plan of aeroplane supporting surface design can-be admitted. The reason for this, as well as the suggested to me by Mr Guy Lowell of Boston, that, whereas we obviously are limited in a direct application of the plan to one point of suspension of the fabric, in the monoplane experimented with there were necessarily two, and in the yacht sail there are at least three

Bowmanville, Ontario, Canada,

### A Machine for Blowing Window Glass

#### The Remarkable Sievert Process

In the usual method of blowing window glass the workman takes up a globular mass of semi-liquid glass with the end of a long from tube and, by blowing through the take and reheating the glass at fatter vals, gradually transforms the built late a long, hellow, this walled eviluder. When this cylinder has cooled, the walled cylinder When this cylinder has cooled, the cubs are cul off, and it is still builthwise and functioned into a plane sheet of glass by heating and

me handral treatment.

In the Nevert process of blowing window glass by machine, which has been employed successfully in several European factories, a disk or cake of glass is first anide by pouring motion glass late an Iron ring by CFE 2, an insert in Fig. 1), reading on an iron called plate a. A blowing-head counserted with an air plue a is then brought down on the ring and attached to the When the glass has couled sufficiently the blowing-head and ring me lifted from the casting plate, carrying with them the cake of glass, which, being in plattic condition, sins, through the ring and meanness the form of a cup, which is then blown into cylindrical form by compressed air introduced through the play a. The Severt process, which can be employed for blowing holton glass vessels of all kinds, possesses the follow-

ing peculiar advantages.

1 The giass "head" of the cylinder or vessel is replaced by the metat blowing-head c, diminishing the quantity of glass wasted or re-meited

2 As this blowing-head may be of any diameter, it is possible to blow cylinders and vessels of extraordinary size

3 Severat shatlow vessels or flat objects can be blown at once with little waste of glass by blowing the cake of glass into a mold having a number of cuvities.

4. The time and skill required for the tedions operation of forming the ball of phostle giass by working the molten glass with the blowing tube are saved, as a cake of midform temperature and consistency is obtained simply to penting the molten glass into a ring laid in a casting plate
5. In the form of a cake of large area and com-

5 In the form of a cake of large area and communityely small thickness a very large quantity of glass can be blown at one operation, willout wasting much time in cooling the glass to the proper consistance.

Hence the process is most suitable for the production of flat objects, wide-mounted vessels and very large objects generally, and especially of cylinders destined to be transformed into sheet gimes. For these diverse uses the process and apparatus

For these diverse uses the process and apparatus have assumed various forms. An luxenious and elegant method of producing very large shallow vessels has been declased. The molten gines is poured on a molet assistato fell which is briskly slacken. The glass dances upon the layer of steam evolved by its own heat and spreads out lind in round cake of small and inform thickness which is blown by the pressure of the implement scann into the furered mold which is brought down upon it. The Dreaden Inventors have recently partented in a rrangement in which the inslication and is mainted on an axis, about which it is oscitlated by an electro-margacet device.

The Slevert process was first employed for the pro-

duction of very large glass vessels, such as both table and formenting vats. For this purpose an apparatus resembling that shown in Fig. 11s used, but the glass is poured, not on a special casting plure, but on the blowtur-head flseif, which is inverted. When the glass has couled sufficiently the apparatus is retinevered und the glass cacke, sagging through the rung, is blown downward into the most. In this case, the ring, which is very large, is made to several partie, which are separated to order to release the vessel.

In order to adapt the process to the blowing of extluders for windrox glass, several important changes were required. A both to be broad and shallow, but a window glass cylinder to long and comparatively narrow. Hence it was necessary, in order to distribute the glass uniformly over the whole length of the eyilider, to place leneath the matchine a deep heating from peculiar construction by which either the whole cylinder or any part of it, especially less pipper edge, could be reheated at my time. It was also necesasty to device a nafe my rapid method of attaching the blowing-head to, and detaching it from the ring which carries the glass cake or cylinder, by a mechanism capable of withstanding frequent and intense heating. This problem has been solved brilliantly plating in the rim of the blowing-head a circular

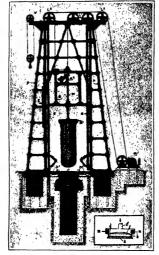


Fig. 1 and Fig. 2 (insert).—Sievert's window glass blowing machine.

electro-magnet mm (Fig 2), which holds the ring securely while the current is flowing and releases it instantly when the circuit is broken.

Two experimental machines for blowing window giass were tried, one in France, the other in Austria. The experience acquired with these machines was utilized in the construction of a third machine, which was put into operation in Suxony in October, 1900. This machine its litustrated in Fig. 1. A fixed frame of girders P, about 30 feet high, supports two vertical guide-rails S, along which the frame R can side up and down. The bidding frame R carries the isolwing-head B, and is raised and lowered by means of a steel wire rope, which runs over the pulley D and around the electrically driven which O'. Little force is required to move the stiding frame, because its weight



Fig. 3.—First Sievert machine for blowing large glass vessels.

is balanced by a counterpoise R, attached to a second wire rope that runs over the pulleys  $L^s$  and around the winch  $G^s$  in a direction opposite to that of the first rope. Safety clutches prevent the fall of the fram-with its load of glass in case of rupture of the rope with its loan of giase in case or replace at the lower suff of a fibellow vertical axis W, the upper end of which is connected, through a stuffing-box, to a compressed air conduit. This axis can be rotated by the motor G. conduit. This axis can be rotated by the motor or, mounted in the sliding-frame. The glass cylinder suspended from the blowing-head can thus be turned slowly without interrupting the blast of compressed air. Under the blowing-head and imbedded in the air. Under the blowing-nead and impeddes in the ground is the deep heating drum F, with its wider and dome-like top F. The lower part of the drum is not heated, but the dome contains a ring of gas-burners Q. by means of which any zone of the rotating glass cylinder can be heated at will by lowering the cylinder meror less deeply into the drum. The top of the heating drum can be closed by sliding over it the cover plates  $D^i\,D^s$ , which are moved by a third electric motor. By as of a fourth electric motor a car carrying a wooden bed-piate and traveling on the rails C can quickly be brought under the glass cylinder to support its lower end, if necessary. The cast cake of glass is brought beneath the blowing-head by a second car, which travels on the same rails. The starting levers of the four electric motors, the lever which makes and breaks the circuit of the electro-magnet on the blowing-head and the tap for the compressed air are placed together in an operating stand beside the main fram of the machine, so that one man can easily control and regulate every operation. This arrangement gives the process a great advantage over all entirely automatic methods of producing window glass.

The manner in which the cake of glass is fustened to the carrying rhag and the blowing-bend is shown in Fig. 2. The rlue h is Zeahaped in section, and the blowing-bend c curries a clicular rabbet d, which projects downward. When the blowing-hend is lowed upon the ring filled with glass the magnet m m takes firm hold of the upper or exterior flangs of the ring, while the edge of the soft cake of glass is placied tightly between the rabbet d and the vertical web of the ring, and also between the rabbet and the lower or interior damage of the ring. When the blowing-head is raised, therefore, it carries the ring and the sagging cake of glass up with it.

The whole operation of blowing a window glass cylinder with the machine is conducted as follows: The car, hearing the casting plate and carrying ring.

The cer, hearing the casting plate and carrying ring, is wheeled to the furnace, and the ring is filled with molten gloss by means of a indie, or otherwise. The car is then wheeled to lie blowing machine, which is provided with guides and stops that bring the center of the ring accurately under the center of the low-ing-head. The llowlung-head is now lowered on the ring and then ralsed, earlying with it the ring and the casks of gloss. Next, the car is removed, the cover plates of the heating fram are drawn aside and the cask of gloss, which has now sagged into the form of a bowl, is lowered into the drum and relastic, while it is rotated slowly by turning the blow-ing-head. When the glass has softened sufficiently it is holsted out of the heating dram.



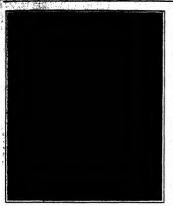






Fig. 4.—The cake of glass, sagging from the blowinghead, which has just lifted it from the car.

Fig. 5.—The car removed and the cake sagged into the shape of a bowl.

Fig. 6.—The finished cylinder suspended from the removing fork.

or three segments, according to its diameter. These cylindrical segments, like the hand-made cylinders, are transformed into plane sheets of glass in the flattening oven.

The capacity and efficiency of this machine were satisfactorily demonstrated by its performance during its first half year of practical service. The production of sheet glass per working hour increased from 25 square meters at the beginning of this period to 87 square meters at its close, and has since risen to 40 square meters. A carrying ring 65 centimeters (20 inches) in diameter, yielding critinders of the same diameter, was used, and the thickness of the glass was 2.5 millimeters (0.1 inch). The remarkable increase in production is attributable to increase in skill, particularly in the avoidance of breshage. At the end of the period it often happened that not one of the 110 to 116 cylinders made in a skill argely due to the uniformity in thickness produced by the construction of the heating drum. The hourly output can be increased by ming larger rings and by substituting for the ladie a mechanical filling system which will keep several rings, catting-plates and cars in operation, thus saving the time (about one minute) now wasted in waiting for the cake to col. The actual blowing of a cylinder occur.

The actual howing of a tyliner occupies only two or three minutes.

The glass is of remarkably good quality, uniform in thickness, free from air
bubbles and with a very even and glossy
surface. These results are due to the uniform temperature and thickness of the
cake of glass, its symmetrical position
with respect to the air tube and the employment of a vertical heating drum. In
the common method the bell of glass is
made up of portions taken up successively
by the blowing-tube and is, therefore,
likely to be neither symmetrical in shape
nor uniform in temperatures. The handmade cylinder, furthermore, is rebeated
in a horizontal position, and sie to
scratches, which are entirely excluded
when the vertical cylinder is anechanicsilv lowered into the heating drum with-

out touching the latter.

The new method of flattening also improves the product. The wide machine-made sylinder is split into two of three longitudinal segments which flatten almost sutomatically on the hot flattening stone. Hence they are exposed to little risk of injury from the iron flattening red, the treatment with the polishing block is shortened, the capacity of the 'flattening red, even is increased, and more viven and glossy surface is obstanced. Moss glass is wasted (4. s. prefarred to



Fig. 7.—The glass bowl lowered into the heating drum.

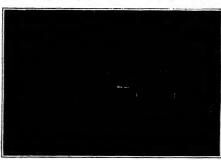


Fig. 8.—Cylinder in the tilting frame.



Pig. 8.—Glass segments stacked beside the flattening oven.

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the melting pot) in the new process than in the old one, but this loss is more than compensated by the saving in wages and other operating expenses the process requires comparatively few workmen, who need not be skilled glass-blow-free the process of the process requires comparatively few workmen, who need not be skilled glass-blow-free the process required to the process of the

From the results obtained in the six months trial of the machine in Saxow it has been calculated that the cost of producing one square meter of glass, cul and packed for slipment, is more than its per cent less with the new process than with the old one. Another calculation, made independently by a Reighm expert, and based on Beigha working conditions, yields nearly the same result. Experience and the introduction of improvements, some of which have been montioned above, may be expected to increase the output and diminish the cost of production still further

The Slevert machine can be employed in the production of crackled, marbled and other varieties of sheet glass, in addition to common window glass, and it finds another important field in the production of glass bath tubs, kneading troughs, milk troughs, wash tubs, acid tanks and other large vessels The operation is conducted substantially in the manner described above for whidow glass cylinders, except that the glass is blown into a mold, if necessary, and the finished vessel is sent necessary, and the minimal vessel is some to an annealing oven instead of to a flat-tening oven. The production of large glass vessels by means of a tilting blow-ing-head into which the glass was poured has already been mentioned, but the Improved machine represented in Fig. 3 offers soveral advantages. The liability to breakage and uneven thickness and tension due to the tilting of the mass of soft glass is avoided, and the uniformity and gloss of the vessel can be improved by repeated dipping into the heating drum, while the electro magnetic suspension facilitates the entire operation. Glass vessels reinforced by wire netting have been made with the old machine and a still more intimate connection between the glass and the netting can be obtained with the improved machine and process

No glass is wasted in blowing vessels by this process as the thick rim that forms about the carrying ring is left on the finished vessel and increases its strength.

The contour of the ring and blowinghead must conform to the outline of the rim of the vessel, but vessels of different depths can be blown with the same ring and blowing-bend, and the diameter of the vessel can be varied somewhat by using, with the same blowing-head, carrying rings with vertical inward-stanting or outward-simiting web.







Photographed with visible light. Photographed with infra red light Photographed

Ara militaria. Chrysotis suripallists and Conurus petzii photographed by visible and invisible light.

#### Do Animais See Things as We Do?

#### By J. Fidel Tristan, Costa Rica State College

A Li. the colors of the ralubow can be observed on the plumage of tiefts. Ture white and interess black are common; the most extraordinary shades are seen among the tropteal humanitar birds (Trocklitiae), some of them showing a metallic luster in many colors. The same can be said of diurnal butterflex, of coleopters and of larve

Naturalists generally try to explain tils variety of colors through the intervention of natural selection and number; When such an explanation is offered it is invariably usessued that ambins see things as we do. The writer helieves that many serious difficulties which have a refrequently most with which masking such psycholeses would subside if the assumption—unwarranted by facts to word when the ambine through most productive to the admirate kingdom, are adapted to one and the same scale of either undulations was producily left aside.

The many ways of living observed in anim imperious necessity of clearly seeing, in very different circumstances, either the game or the hunter, are so many factors which may cause the sight of animals to differ from ours - It is well known, for instance, that some birds can see small objects from a distance which causes them to be, for us, lost in a haze, created by the stmospheric diffusion of the blue and of the violet. Other birds, manmuis, and insects begin their quest for food after sunset, when light contains a high percentage of extreme red and infra-red ruys, which hardly make any impression upon our retina. In the tropica forest, a simple oil lamp will fetch an incredible num ber of butterfiles and other insects, the existence of which could not even be suspected during the day. These facts and many others seem to show that the eyes of some animals are probably more sensitive than ours to one or the other extreme of the spectrum, and that the relative hundrous value of colors may not be for such animals what it is for us. The results of the ollowing experiments, recently made by the writer, sem to him of such a nature as to lend additional force to this hypothesis; the following stuffed species were placed in a mass of green foliage: Ata militaris, Chysolis auripulliata, and Conurus potzii, two of them being partially or totally of such a green color as to be easily mistaken, at a distance, for a part of the Three photographs were tuken of the whole: one in visible light, one in ultra-violet light and one in infra-red light, the last two by means of Forcault's silver film and quartz lens and of Prof. Wood's cobalt glass and yellow film. On the photograph made in the infra-red light, the green plumage and fur, which do not reflect the infra-red, come out as dark spots over the clear field of the foliage, which strongly reflects Here we have two kinds of green, which look allke to the human eye and which would appear as entirely different to an eye which would be some at more sensitive than ours to the extreme red.

Another group photographed in the same manner is also reproduced, and the unmerous differences, seen at a glance, give an idea of how things would appear to any eye for which the scale of perceptible vibrations would have been either raised or lowered by even a

#### The Longest Aeroplane Flight

BRINDEJONC DES MOULINAIS, the French attman, landed at 4:20 oclock on July 2nd at the Villacoublay secondrume, near Vermilles, thus terminating his wonderful flight of about 3,000 miles from Parls to Rt. Peterbung and back and establishing a record for the longest aerial voyage so far accomvibled.

The following is a diary of the fight: June J. Paris to Warsaw, 803 miles: June 16, Warsaw to Drinds, 830 miles. June 18, Warsaw to Drinds, 830 miles, June 28, St. Federsburg & 184, 205 miles; June 28, St. Federsburg & 184, 205 miles; June 29, St. Scholand, 205 miles; June 29, St. Scholand, 205 miles; June 29, St. Scholand, 205 miles; June 20, St. Scholand, 205 miles; June 20, The Hague, 830 miles; June 2, The Hague 85 miles; June 2, The Hague 85 miles; June 2, The Hague 184, 240 miles.

M. des Moulinsis was escorted on the last stage of his great flight by French airmen.

## Results of the Prince Henry Aeroplane Circuit Race in Germany

FOR the third time there was held (in May last) in Germany a circuit race by German aeroplanes for the Prince Henry cup. This race lasted three days, and vn over a triangular circuit The cour from Wiesbaden to Cussel, from Cassel to Coblenz, and from Coblenz to Karlsruhe, a total distance of 354 miles. Nineteen machines started in the contest, of which seventeen fluished the first stage, four not arriving nutil the second day. Ten military acropic and three civil pilots made perfect flights. The flight the first day was made under good weather conditions, but the second day's flight was a difficult one, as a rauge of mountains had to be crossed and the weath was bad Only ten machines completed this stage. The third day's flight was made under excellent weather conditions. Four military and five civil pilots completed this stage, out of the eleven military and five civil pilots that started in the circuit. Following the circuit, two days of scouting were held by military chines only, in which twenty-three pilots started. trip to Strassburg was made with a stop at Pforzheim teen avintors landed and re-ascended at the latter place and seventeen arrived at Strassburg. Twelve left the next morning for the flux) flight to Freiberg and Neubreisach, where landings and reports were to be made, and of these nine returned to the starting point. The reconnoitering reports made while in flight were handed in at the various landing places and new tests were set for the aviators. These scouting flights in reality saved the event as far as the military aviators were concerned, for in the three days of cro flying many of the army aeroplanes suffered motor breakdowns. In awarding the cups, at the conclusion of the circuit, Prince Henry called attention to the lack of reliability shown in the motors

Lieut. Canter on his 57 horse-power Rumpler "Taube" monophine, wan the Emperor's cup for the best performance throughout the circuit, and also the second casts prize for retudility, as well as the Prince Henry

prize for the best performance in the military securing competition. Other important prises were won by Engineer Schlegei on a 100 horse-power Arstit monsplane, by Lieut. Joly on a 95 horse-power Gotha monsplane, by Lieut. Carganice on a 100 horse-power L v. d. blplane, and by Lieut. von Beaulien on a 95 horse-power Abstross biplane.

The First International Moving Picture Show CHAND CENTRAL PALACE in New York city was cliast week the center of the moving picture world. More than three thousand delegates from all parts of the United States and Europe were in attendance at the third annual convention of the Motion Picture Enhitor's League of America, which, in conjunction with the First International Exposition of the Motion Picture Art, opened on July 7th and lasted until July 12th.

Visitors at the exhibit saw low dinas are made from the raw material; how the leases and projectors are developed from rough glass and metals to the finished product; how the pictures are taken, and isst, but not least, how the completed film is thrown on the screen for the benefit of a public which has ceased to wonder at this recent product of actione. On the measurable floor there were four model picture theaters, to which admission was free.

One of the principal attractions proved to be a moring picture shooting gailery. Here for hours the visitor could safely fight photographic battles with fierce African gules and the sportsman could shoot at for or rabbits filting on the screen for all the world as if in real life. This apparatus is fully discussed on another page in this issue.

Kinemacolor pictures played an important part in the exhilit. Not only were the machines demonstrated at a booth on the main floor, but moving pictures in the original natural colors of the subjects were shown in the kinemacolor theater. In this theater exhibitions of the natural color process were given at hourly interval: It will be readily realized that such an apparatus as this, adaptable to a diversified list of subjects, is bound to prove of great beaneft to schenes.

Although moving pletures in colors were introduced something over a year ago a great many improvements have been made recently, especially in the color screen through which the light from the projector passes before striking the film. The latest type of kinemecolor machine has a new reviving color screen which per mits of adjustment in order to synchronize the acreen with the movinc film.

Color Bilndness in Astronomers.—Dr. Edward C. Pickering, Director of the Harvard College Observatory, has tested the sensitiveness of the eye to various rays of different colors for numerous astronomers by grouping their estimates of the light of the stars scoording to their color, as shown by the class of spectrum. The earliest estimates, those of Polemy and Sud, show results agreement of the color, as shown by the class of spectrum. The earliest estimates, those of the class of spectrum. There shows a marked sensitiveness to the red, and field to the blue rays. The latter effect is still more marked in photographic plates. All are referred to the Harvard standard, shown by the horizontal lines.







Photographed with infra-red light.



Photographed with sites-vielet light.

A group of stuffed birds of different species photographed with visible and invisible light.

#### Inventions New and Interesting

Simple Patent Law; Patent Office News; Notes on Trademarks



The state of the s

with auxiliary reflector in full-light position.



Highway brightly illuminated to a considerable distance by a pair of double-reflector searchlights.



Bridge approach lighted by two doublereflector searchlights.

#### Double-reflector Searchlight for Automobiles By F. C. Perkins

PiCTURED in the accompanying illustration is a new mearchlight of German manufacture which is provided with a principal reflector and an auxiliary reflector. The principal reflector is a spheroid glass mirror, silvered on the reverse side and having an exceptionally large aperture ratio, the diameter of the free aperture and the focal length being respectively 10 and 8½ inches in the larger size and 8 and 2½ inches in the smaller size. It will thus be seen that increes in the smaller size. It will thus be seen that in view of the short distance of the fame or light source from the mirror, the latter gathers up a repriarge volume of light. The partly diagrammatic sectional view of the searchlight shows the auxiliary reflector first in its full light position in front of the light arce and then in the subdued light position off the light rays from the main reflector. It will be observed that in the latter position there is wide dis-persion of the rays of light, whereas in the other posionly is the light reflected from the prin reflector in the usual way, but it is also supplemented by the small auxiliary reflector. Only a small propor-tion of the light proceeding from the principal reflector is intercepted by the auxiliary reflector and this is made good several times over by its effect as an intensifier. On country roads the auxiliary reflector is turned to the full light position. When motoring through towns where gasoline searchlights are prohibit ed, the auxiliary reflector is turned through an angle of 180 degrees to the subdued light position, when the rays will be dispersed to such an extent as to give a general illumination. As the auxiliary reflector is ex posed to an intense heat, because of its nearness to the source of light, it is made of a special glass capable of resisting the effects of high temperature and abrupt changes. The front glass of the searchlight is made of the same material, which does away with the necessity of building it up of several strips. This naturally affords a far better protection from dust and dirt than a cover made up of strips.

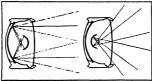
#### An Automatic Electric Light Plant By F. C. Coleman

N OTWITHSTANDING the large number of electric N generating stations that have been put into opera-tion during recent years, there are still many places devoid of a public supply of electricity. Numerous small plants have been constructed for lighting private houses, etc., situated in such localities, particularly since the advent of the internal combustion engine.

An interesting generating set of this description is manifectured in England, which starts and stops quite automatically, according to the load and condition of the storage battery. A plant of this type may be shut up in a room, where it will work without the alightest attention bayend filling of the gasoline tank and occu-

steation beyond filling of the gasoline tank and occasionally adding a little circulating water.

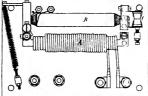
The singline is of the four-cycle type. Its cylinder is
water-faceheed and the top end is fitted with a removable covic. The vaires, which are well cooled, are of
pickel steel seel and are piaced in a side poolse. The carbeauther is of the constant level type and is supplied by
a small feed pump. It is claimed that it is impossible
for the extraorise to be fooded. Since the engine is
justeded in work without attention, it is evident that



Dispersed-light Full-light positi-Automobile searchlight with reversible auxiliary



Automatic electric lighting plant.



Relay switch providing automatic control.



act mounting of the lighting plan

the system of lubrication must be perfectly reliable and that oil must be supplied to the hearings as soon as the plant starts itself. To meet these conditions a force nump is provided. As soon as the engine commences to rotate, oll is pumped into the nulu bearings. afterward returned to the crank-case where a constant of oil is unintained Eugines of this built for all classes of service, and capable of working with gasoline or kerosene, or by using a special vaive, town gas can be used instead of liquid fuel. The whole of the plant, including engine, dynamo, controller, or automatic starting switch, and water tank, is mounted on two cross girders. Therefore the plant can be picked ap bodily and transferred to any new position with

The complete plant comprises the engine, dynan and a small battery, the capacity of the last being very much below that of an ordinary private electric lighting plant. When the battery is properly charged and no lights are connected to the circuit the engine remains at rest. On switching on a number of lamps so that the current does not exceed the normal dis-charge enpacity of the battery, the engine may still remain stationary until the voltage of the battery drops to a certain value. The engine then starts automatic ally and charges the battery. It will also start if the load exceeds the normal discharge rate. When the battery is charged and the lond is low enough to be ilt with by the battery alone, the engine stops run ning. Hence the battery cannot suffer owing to improper handling. The battery is charged at the times it needs charging, and the charge stops when the correct voltage per cell is reached. There is not the least doubt that a great deal of harm is done to the batteries of private plants by overcharging them, and automatic control should prove a great boon in this respect. Even if the automatic goar got out of order and the battery was damaged in consequence, it is to be remembered that the cells are small and can be renewed at comparatively little cost. We are told, however, that the control gear never does get out of order.

Turning now to the principle of operation, let us some that the small battery is fully charged and assume that he shall outer is this charged and that there is no load on the mains. Under these con-ditions the engine is at rest and there is no current flowing in the circuit. If, however, lamps are switched on which give rise to a load in excess of that which can be dealt with by the battery, the engine is started in the following manner: The current momentarily supplied by the battery passes through the series coil supplied by the battery passes through the series coil. A of the relax, which is mounted on the switchboard. The effect of this is to cause the upper of the two contacts C to be pulled down so us to form a councer tion with the counter below it. Current then passes into the dynamo and causes the latter to act as a motor and the engine is therefore run up to speed. To limit the starting current, however, a resistance switch is interposed in the circuit. This switch is fitted with a solenoid which gradually cuts out the resistance as in the case of a remote controlled electric motor. starting resistance is to be seen at the point A in the general view. The starting current of the set is rather small, because while the engine is being run up to sman, because while the engine is being run up to speed electrically the exhaust valve is lifted off its seat, and therefore no compression takes place. But when the arm of the starting switch reaches a certain

(Concluded on same St.)



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#### Price Maintenance and Modern Merchandising-III Price Protection Distinguished from Trust Control

By Louis D. Brandeis

ON May 14th, 1913, the Association of National Advertising Managers met at the Hotel Astor in New York and discussed the subject of price maintenance. Once of the Aprakers was Mr. Louis D. Brandels. In his address he very clearly shoved why the mointenance prices on patented and trade-marked orticles is not to have the manufacture prices by a trust. The following is an abstract of his lucid presentation, slightly edited to give his remarks more the character of an

The problem discussed by Mr. Brandeis has been considered from another angle by Mr. Henry B. Jou, president of the Packard Motor Car Company. "An article is not sold until it is purchard by the consumer," says Mr. Joy. "When you sell a hill of goods to the wholesafer or retailer, that is merely a step in the process of sele, which you naturally should have a right to control. The selling in their should and must include the right to control the intermediate agreeies of sale between you and mass measure the typic to thirty in bacteriarous openior. One deduced not and four real patron, the consumer, . . . The mensificativer must have the right to see that his goods reach the consumer with the least possible cost of intermediary processes. . . Then will the goods reach the consumer at the least possible cost, which it is to the interest of the manufacturer that they should do."—Entros.]

I can conceive of nothing more prejudence that the She dicial to the maintenance and extension of the right of a manufacturer to fix a protect the small m selling price to the consumer than to rail cuerally against the provisions of the Sherman inw, or against the attitude of the Government in endeavoring to enforce that beneficent statute.

The danger to busine fact that men have failed to draw the distinction between a manufacturer fixing the retail selling price of an article of his own creation, and to which he has imparted his reputation, and the fixing of prices by a monopoly or by a combination tending to a monopoly If what is desired were the perpelua-

tion of monopoly there would be no chance whntsoever, in my opinion, of preserving any existing right to make fixed selling es, or of extending further that right, us I think it should be extended; for the American people are wisely determined to restrict the existence and operation of pri-

The manufacturer's position is simply this: "That which is specifically mine, that which I create, and the good will which attends it—which was originally confined to my particular establishmen but now extends throughout the whole country, or perhaps throughout the whole world, that is my specific property; I have made it valuable to myself and I make it valuable to the consumer; because I inve endowed that specific property with qualities on which everyone who purchases my goods may rely. That cer taluty is of value to the consumer, as it is of value to the maker

Now, fixing prices under those circum stances has in it no element of monopoly Operating as an independent manufactur er under competitive conditions, you fix the price at your peril. If you fix it too high, one of two things is likely to hapoen; either the community won't buy it. or, if it does despite the high price, some other person will come in and share your prosperity—so long as you have a field open to competition; and the price will fall if there is no combination. To so fix the ultimate selling price in a competitive business is not a restraint of trade in any proper case. On the contrary, it stimu lates trade, because it gives an appropriate reward to the man who creates; and it is of the essence of trade to make as large as possible the rewards of successful crea-tion. As long as we maintain condition-favorable to competition and the freedom development which leave the individual's development untrammeled by superior power—so ions nov we safety allow men to take what profit they can get from an expectant pub lic, and to exercise the inrgest degree of liberty in the marketing of their products.

But the moment that you endeavor by a combination of superior power to clos the field to competition or to restrict indi vidual effort; the moment that you take away from the people that protection which comes from the incentive in the in dividual to create, and in the opportunity of the customer to discriminate in his pur chases (as you do when you close the avenues of compatition) them a grave danger arises to progress, and it is against such

printely directed. That statute seeks to protect the small man against the pov The Sherman law seeks to protec men in the right freely to compete, and to prevent practices which must result in to prevent practices which must result in suppressing competition. It seeks to pre-serve to the individual both the opportun-ity and the incentive to create; it seeks to encourage individual effort; and the right of an individual manufacturer in a competitive business to market his goods In his own way, by fixing, if he desires, the selling price to the consumer, is in the seiling price to the consumer, is in entire harmony with the underlying pur-pose of the Sherman law. But when men combine to form a monopoly, or control a particular line or branch of trade, however good may be their intentions, they necessarily curb individual effort. the fundamental laws of human nature and of trade they withdraw incentive from those who enjoy the monopoly, and they narrow the field of human effort by con-fining leadership to a comparatively few individuals. And even where a complete individuals. And even where a complete monopoly does not exist, a powerful com-bination makes it so difficult for others to enter the field that most men are prac-ticulty barred by the great chances of failure in entering upon so unequal a contest it is against such conditions that th Sherman law was directed. That is, the true restraint of trade-restraint through monopoly or combinations tending monopoly, a condition under which be ness success is at best temporary, is ofter delusive and is always purchased at the expense of the community.

Now I take it that the effort which was further the right (as it now exists in respect to patented articles) to fix selling prices to the ultimate consumers and which finds expression in Section 2 of the Oldfield bill proceeds from an admirable But though the motive is good and the purpose worthy, the course pur-sued is a mistaken one. And the mistake arises from the failure to recognise that certain hardships inflicted by conspicuous trusts which do fix prices, have not arisen from the fixing of the wholesale or retail prices, but from the fact that a monopoly or combination existed which made it nos to fix those prices at an unr ably high figure. In other words-it was not the fixing of the price, but it was the power of the great trust behind the pricefixing which was the cause of the hardship which it is vainly sought to remove by Section 2 of the Oldfield bill. And the way to remove both the commu ity's anxiety over price-fixing, and your anxiety over the effort to limit that right, is to suppress private monopolies and combine ions of like character.

Make clear the distinction between that

nonopolizing, which the Sherman law eeks to prevent and to extinguish, and that price-fixing which is an incident of the individual development of business and the busiding up of reputations of goods as of individuals—take up the work and the building up or reputations or goods as of individuals—take up the work of education on those lines, and you will, I am convinced, succeed and ultimately will get such wise legislation as Denmark has given to her people on this subject.

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ossity portable. SSIS. Wanted to buy Leath Inquiry No. SSIS. Wanted to buy Leath Horse Stock by "deemporarily when shoe can saled on. In other words a Leather Hoose shoe as bostom—strapped over hourse foots."

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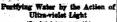
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Appl ctric



(Ossoluted: from ages 45.)

ber over and over again to the same lamp,
or by peasing it successively into the
luminous sone of several lamps. Besides,
the apparatus must be so constructed that
the water, while under the influence of
the light, is strired up so as to turn over
and over microscopic suspended matter
which might have escaped direction and
which might screen microbes from the
light.

A typical European starilizer is to be found in one of the suburbs of Rouse, France. For over two years this instaliation has supplied water starilized by ultra-violet rays. Since the introduction of the system not a single typhoid case has been known among the subscribers, whereas the percentage of typhoid cases in neighboring districts is appreciable. The most recent types of sterilizing approximation of the process of the system of the system

The most recent types of sterlitting apparatus are characterized chiefly by the fact that they use the light in a more ecnomical way than any apparatus hitherto constructed. The principles involved are such that the construction of very large sterlitting units is possible.

The apparatus consists of a tank or

ong canal through which the water flows Balle plates are interposed to stir up the water as it flows. Into the walls of this tank are inserted at intervals of severa feet, quartz tubes fitted water-tight to vertical plates constituting part of the walls of the sterilizing tank. These quartz tubes are about two inches in ulameter and eight inches long, and are closed at the end. The vertical plates are provided with external metal boxes which carry the lamp supports. The lamps are not unlike a pistol in shape and are characterised by a very narrow U-shaped luminthat it nearly file the two-inch quartz tubes. All the light produced by these "pistoi" lamps therefore enters the water hrough these quartz tubes, whereas th through these quarts them, whereas the lamp itself is protected from contact with the water by these same tubes. This is of importance, because the production of ultra-violet rays in quarts mercury vapor temperature of the tube (the iampe usually run at a temperature of about 800 deg. Cent.). It is, therefore, necessary to prevent the lamps from touching the water, which would cool them down to such an extent that the production of ultra-violet rays would be very low and

uneconomical. The sterilising canal is equipped with a maximum of tweive such lamps, each uning 1,800 watts. One of the installations has been running for eight months and sterlises the water in a municipal plant at the rate of 1,700,000 gallous per day. Most of the time only a few of the lamps are illuminated.

In larger water plants, several such canals may be operated in parallel. If the unit is small fewer lamp, even only a single one, may be employed and the sterllising tank reduced correspondingly in size. In the latter case the baffle plates must be so arranged that the water is led several times near the single source of labels.

The small apparatus illustrated in the accompanying engraving has been used for military work as a field starilizer. The complete equipment in this case, mounted on a run carriage, consists of a gasoline hactor generator set, water pump, fitter, and the ultra-riolet ray starilizer.

A similar outift has supplied water to a Said hospital during the French-Morocco campaign where it has been in containt use for nearly two years for supplying water for dithinks and surjects purposes. The respect by the sulgeon in charge states that these has been no case of hospital sixfection or typhoid during all this time, proving thereby the utility of this sterilling apparatus.

Et is, wideon that the application of

It is evident that the application to the application has developed into an industry which promises for a many with the district of the district of the area with the districts embed by the area with the districts embed by the area with the districts embed by the area with the district of the district of the area with the district of the area with the district of the area with t



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An Automatic Electric Light Plant position the exhaust valve is released and compression therefore occurs at the proper vals. The dynamo then ceases to act as a motor. As the speed rises the mo commences to take up the load and to put current into the battery. If, however, the load is light, say, a load of two or three lamps, the engine is not started when the lamp switches are closed, for the current needed for such a load car easily be supplied by the battery. ch a small current is passing through the coll A of the relay, the magnetism pro duced is sufficient to draw the contact C downward, and consequently the engine remains at rest. But after these two or three lamps have been burning for a cer tain period the voltage of the battery naturally begins to fail, and ultimately the mre at the terminals attains a value ers further discharge undesir-At this point it is nece the engine to be started. To enable this to occur the relay is also fitted with a simple coil B, which is connected across the terminals of the battery. Obvious as the voltage of the battery falls the agnetism produced by this shunt coll lminishes. When this occurs the spring on the left of the relay lifts the shunt magnet so that the lower contact ris and touches the contact above it. This also causes current from the battery to be supplied to the dynamo, when the latter acts as a motor. The engine is then run up to speed and charging takes place in the manner already described. It will be seen that the plant is absolutely automatic in action and the engine is started and stopped according to the demand for the load and the condition of the battery. There is one trouble which might arise if engine were allowed to run short of gasoline or if the ignition system failed to operate. Clearly under these conditions the plant might be driven by the battery until the cells were exhausted, this havng anything but a beneficial effect upon

#### only enhanced in the manner described, but also cuts off the current in the event of the plant's being overloaded The Current Supplement

IN this week's beare of our Suprements I. R. T. Mohas writes on the scientific advancement of the canning industry.—A. H. Brown describes an automatic astronomical calculator, which replaces long and tedious tebular computations by simple automatic mechanical operations.—It is well known that the manufacture of white lead is fraught with danger to the health of the workmen. A sanitury system of handling white lead is described and illustrated—A very important article appearing in this issue is a discussion of "The Principles of Fuel Oil Engines," by Ford C. F. Hirschfeld.—Il. Passavant writes on the uses of artificial insulating materials in the construction of electrical apparatus.—G. Gilmour contributes an article on Safety Engineering.—Another subject dealt with is the mechanical design of switches.—The average cost of killing a man in war is \$15,000. Contrast with this the cost of saving a hunan life by strict attention to sanitary requirements in the cansi sone: \$2.43. This is one of the points brought out in an article on Life Preservation.

#### A Method to Prevent Tarnishing of Silver

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until the cells were exhausted, this having anything but a beneficial effect upon the battery. To prevent used an occurrence, however, a time limit circuit breaker el provided on the switchboard. This breaker will allow a motoring current to pass for a stren period only, after which it interrupts the circuit. The breaker not only eliminates the possibility of the bat.

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## and Queries.

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compensation, to overview, and we would not say that it (1920) B. M. M. saket. It is an old anyling that black colors draw the heat, and some say they absorb heat, one Now, is it a fact that a tank of a siven size filled with water will like hottee (the water) by the rays of the same dimensions left unpainted, being of the same dimensions between the same dimensions between the same dimensions between the same dimensions that the same were of a bright scriber in the same than it the tensit were of a bright scriber; so too, a rough surface absorbs he tempor readily than a smooth one. (12830) W. D. sake: Does a vapor one.

blade surface absorbs heat more readily than a bright surface, as the properties of the process surface absorbs he is more readily than a smooth one. (12830) W. D. asize. Done a vapor-bave the ame properties as a pair A. A. at the properties of the process of t

to travel a measured distance. (19851) W. C. MoN. writes: In your curry number tewere thousand sight: hundred and sighteen. In reply to J. T., referring to bensol as a corrector for heavy ofth for use in old engines, are you not mitstaken when you shade. Mr. I may be sufficiently and the sighteen of the sight of the (12831) W. C. McN. writes;

## Lost power means worn metal



"X" indicates the motor where your power develops. But:

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If motorists understood better the costly results of unnecessary friction they would select their lubricating oil with the greatest care.

Only oil of the very highest lubricating sailty can properly protect the moving parts.

Only oil whose "body," or thickness, is suited to your feed system can properly reach the friction points

Correct "body" is quite as important as correct quality.

And correct "body" cannot be deter-mined by guess.

Motor-constructions differ widely. Be-fore the correct "body" for your feed re-quirements can be delermined, the con-struction of your motor must be known and carefully considered.

To this end, every year we analyze the motor-construction of each of the season's models. Guided by this analysis and by practical experience we determine the correct grade of (argoyle Mobiloil for each make of car

The correct oil for each car we then specify in a lubricating chart (printed, in part, on the right)

part, on the right)

The oils specified have extraordinate warming qualities and will retain an efficient lubricating "body" under the most suits the feed requirements of each car they are recommended for

The lubricating chart in this page represents the professional advice of a company whose authority on scientific lubrication is unquestioned the world over The Vacuum Oil Company

If you use oil of lower lubricating qual-ity or of less-correct "body" than that specified for your car, your motor must face loss of potwer, unnecessary friction, and ultimate serious damage

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See the name and our red Gargoyle on the container

A booklet, containing our complete lu-bricating chart and points on hibrication, will be mailed you on request



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grees of the most modern design.

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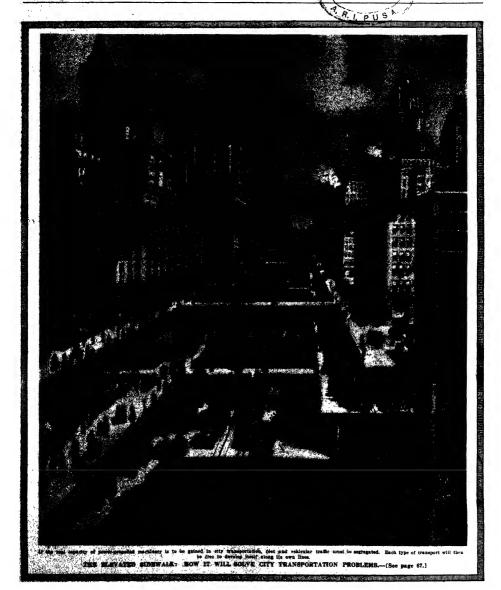
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The purpose of this journal is to record accurately, simply, and interestingly, the world's progress in scientific knowledge and industrial achievement.

#### Should the Government Manufacture Its Own Armor Plate?

LITHOUGH there may be some division of opin ion as to the wisdom of certain of the policies of the present indefatigable Secretary of the Navy, one, surely, will deny that Mr. Danlels, during the w months he has been in office, has given every evidence of a sincere purpose to promote the interest of the Navy by the use of every means at his command; and if that conviction should become fruly settled in and it that converted should become many section in the minds of the people of this country and their repre-sentatives in Congress, Mr. Daniels will be in a fair way to secure many of the betterments of conditions at is aiming. One of the most important innova tions which he has suggested is that of the construction by the Federal Government of an armor-making plant of afficient capacity to enable the Government to supply fifty per cent of the total amount of armor plate re ed annually for the construction of warships.

There was a time when the SCIENTIFIC AMERICAN would have strongly opposed any such suggestion, on the ground that previous experience had shown work of this character to be more tellous and more costly then similar work when done by the private contractor. But with the lapse of time conditions have changed, and the results obtained in Government manufacturing plants, particularly during the past decade, have shown superior product cau be ment shops and yards, which, if the labor restrictions are considered, compares favorably with the cost of contract work. Results obtained in the construction of the battleship "New York" prove that the above broad statement is true, even in the case of warships that are hullt at navy yards. The "New York" was built within the limits of the appropriation, and the navy yard bld came within a negligible amount of the bid put in by the private yards. In this comtion it should be noted that the work on such ships is of the very highest character, fully equal to similar work in private yards; and there is always the great advantage to the may yards to maintain a large and thoroughly-drilled force, which understands the peculiar work of the pards, and is always available should a

sudden emergency of war arise

The wisdom of the construction of a Federal armor plant will be settled if a satisfactory answer can be given to two questions. First, could a Government plant when built organized and by thorough working condition, turn out a product equal to that now de livered by the private maker? Second, could it deliver this product at the same or n less price than is now paid by the Government? In answer to the first question it is sufficient, surely, to point to the exceedingly fine paval gun shop at Washington, where a large part of the armament for our warships is built, the o of which is believed to be as tine as that delivere any gun shop. Government or private, the world over or to the excellent product of our navel powder factory. It is stated by the Bureau of Ordnauce of the Navyvery good reason—that the Government output of guns is equal in quality to that of any gun makers, and that our gowder, so far as comparisons can be made, is decidedly superior in alt-round efficiency to any other

As to the question of cost, the Secretary of the Navy

has informed the Senate that a plant capable of turning out ten thousand tons of armor plate a year, or about half of the armor needed on a two-battleship programme, would be \$8,456,000, and that when this plant was in running order, armor could be delivered at a cost of \$314 a ton. The price now paid is \$454; so that if the Chief of the Bureau of Ordnance who supplied the figures is correct, and there is every re to believe that he is, a saving of \$140 a ton would be to conseve that he ha, a saving or \$130 a ton wound or effected over the present price. This would represent a saving to the Government on ten thousand tons of \$1,400,000 annually. After deducting four per cent interest on the investment in the plant, there would still the price of the present of the investment in the plant, there would still the price of the present on the investment in the plant, there would still the price of the present on the investment in the plant, there would still the price of the present of the pres remain a net saving to the Government per year of over

A review of the facts, then, seems to justify the enate and Congress in voting the necessary appropristion for the construction of such a plant.

E offer no apology for referring editorially in two successive issues of this tonnection. ▼ ■ the question of oil fuel. Last week we indi-cated some of the serious contingencies which might arise if the Navy made a sweeping change from coal to oil fuel. The question is of national importance; for anything that vitally affects the Navy is of vital importunce to the peace and permanence of the nation.

this age of rapid development it not infrequently happens that the progress of invention, with a positivemappens that the progress of inventions, with a positive by startling stride, will give to one of the natural products a position of commanding importance never dreamed of until the fruitful inventor opened up new and wider fields of usefulness. The latest, if not the most conspicuous instance of such a development is to most conspicuous instance of such a development is to be found in the case of perfolem. Formerly valued almost exclusively as a source of light, its field of us-fulness has been rapidly widened by the advent of the laternal combustion engine, the automobile, the motorboat, the suxiliary cruiser, and the seroplane and the dirigible. Concurrently with this rapid widening out of its field, there was started and carried to a successful demonstration that elaborate series of gations and luventions which have given us the perfected oil burner and the successful use of oil as a fuel for steam generation.

The result of this widespread extension of the use

oleum has been to give to this natural product a position of commanding importance, both to the na-tion and to the individual. We pointed out last week how seriously our national interests were or might be affected by the availability and cost of this fuel, and arected by the availability and cost of this fuel, and we wish now to suphasize the fact that the progress of invention has made the same questions of availability and cost of very intimate importance to the health and pleasure of the individual citizen.

By way of emphasis, it is sufficient to instance the utomobile and its humbler brother, the motorcycle. The past three or four years, thanks mainly to the skill of the automobile and motorcycle manufacturer, have seen a wide extension of the previously comparanarrow circle which include able to bear the cost of purchase and ownership. cost of the fuel, which has been so steady and has a sumed such proportions as to discourage many people limited means who had hoped to become owners of their own machines.

view of the above facts, the petrol note with much gratification that the United States Department of Agriculture has called a meeting in Pittsburgh, on August 1st, to which a score of diff eut societies have been invited to send delegates, and that the gathering will devote its attention mainly to the question of petroleum and its various by-products.

The movement is being promoted by Irving C. Allen,
the expert on petroleum of the Bureau of Mines, who has given the following statem nt on the object of his

"A study of petroleum and its products has never ughly or comprehensively made within the United States.

"Sluce each year crude petroleum and gases are produced in the United States, having a value in excess of \$200,000,000, it is most important that a thorough study of these materials be undertaken.

study of these materians be unsertanen.

"This study should include the origin, geology, statistics, drilling methods, transportation and uses of crude periodeum, and a critical and extentife description of petroleum products of all kinds, including bitumen and gases

The proposed technical hody will work in co tion with the International Petroleum Commission, organized in Paris as far back as the year 1990. This on on the part of the Bureau of Mines should receive the whole-hearted co-operation of everyone who is interested in the petroleum question, and particu-larly of the powerful manufacturing corporations which directly or indirectly are dependent upon the petroleum ludnstry.

The Grade-creating Buneau

HITHER familiarity three, comment
desprey no. 1; to contain a side of the contain and indifference to the dealth and familiar as result from once of the needless adaptes in a chief public be exposed. Unbeyrily, us only or, us over your and to find clear, proof of the centre of the mainty pertia which take their large annual to the centre of the mainty pertia which take their large annual three three contains the central transmission. numan life, there are certainly few which are more of human life ventable than the grade-crossings of railroads. a century or so ago, when capital was scarce population more thinly spread over the land, it would have been idacing an intolerable burden upon the railroads to demand there should be no crossings public highways at grade level. Practically as cities, were built at street or highway level. The necessities of the case made such construction com-pulsory. But with the times conditions have changed. The better managed (or shall we say the more humani-tarian?) of our railroads have of their own volition abolished the grade crossings, or are now engaged in doing so. From motives of convenience and cost of operation alone, the average railroad manager would gladly abolish every grade crossing from the system. Looked at from his standpoint, grade crossings are a cause of delay and expense, to say nothing of mental strain they entail upon the engineman and the perpetual anxiety to the management; while leaving humanitarian considerations out of the question, there are the legal costs of compensation in case of accident and the always-dreaded notoriety and unpopularity which follow a grade-crossing accident.

So far as the railroads are concerned, undoubtedly the chief chatacle to the removal of grade crossings has the chief constants to the removal or grace crossings has been the expense of the reconstruction; but of late years it has come to be recognized that the cost of elim-ination should be considered as a joint obligation on the railroad, the State, and the municipality in which the crossing exists. It is under such an arrange that Chairman McCail of the Public Service Com sion has made an appeal, which we trust will re-ceive the favorable consideration of Governor Sulser. asking that the State appropriate \$1,000,000 as its share toward eliminating railroad grade-crossings in thickly-settled suburbs of New York city.

The appeal of the Commission is accompanied by an illuminating report upon present conditions, in which it is stated that on the Long Island Railroad system glone, there are 607 crossings at grade, of which less than haif, we learn to our autonishment, are protected by gates, flagmen or even alarm bells. In greater New York alame there are 477 grade-crossings which are designated as daugerous. It is noted that in Brookly between Norwood Arenue and Jamaica there are from 210 to 322 train movements, daily, over the crossings at each street, and that at one of the at each street, and that at one of these an average of 423 school children cross the tracks four times each Again, an investigation of Railroad Avenue in Brooklyn showed that in an hour and a half 453 persons went over a crossing, over which 11 local trains and 25 express trains passed during the same period and 25 express trains passed during the same period. In the four years, 1908 to 1912, 100 persons were killed at crossings within the limits of New York, and 150 were injured.

distribution of the cost of abolishing grade ings in this city is that one fourth is borne by the State, one fourth by the municipality, and one half by the railroad companies concerned. The companies as themselves as ready to proceed, and the city iso granted its share. The question of the removal of grade-crossings, and the abolition of conditions that are a disgrace to our civilization, is thus squarely in the hands of the Chief Executive, to whom the raitroads and the citizens of New York are looking for immediate and decisive action.

The Tenth International Geographical Congres

FTER being postponed for a year and a half, the tenth international geographical congress, which met in Rome this spiring, was occupied especially with discussing the international map of the world and polar exploration. Under the former head it was an unced that nine countries (including the United States) had undertaken the preparation of sheets of the international map in accordance with the pro-gramme drawn up at London in 1909. It is now preposed to hold another internation sed to hold another international conference, by in Paris, to settle several details of the un ably in Paris, to settle several details of the under-taking. The International Polar Commission had a secting in conjunction with that of the compress, and many chilment polar explorers and antibucines were in accordance, including Pary, Cagat, Brayan, Monden-abilid. Jeculute, and Stotingson, Greek fahrenet vers shown in the Canadian Argue seposition, suider Shattis-son. A proposal to not dispusable to the publical the grange of the Congresses laid for 4 hirsyl. Signeration, as-minated only by the object of the Sanstiana to Sander upon their own inargues if the Sanstiana the Sander upon their own inargues if the Sanstiana the Sander

Manufacture The Secretary of the Market at the spinion that by the disposal of buildings of dutheling are dutheling as the property of the standard standard water, and by conservative appropriation of entering the affects to persuade Campriss to live up to the wee-basicalipe-a-year programs while in the minimum necessary to keep our navy up to a reasonable strength for its duties.

awy; up to a resonance screenin for its duties.

"Min Sepfects a Datah Eurentian.—A correspondent in Holland draws our attention to the fact that the construction in that country of a feating dock of 14,000 tens, for Sovenbaya harbor is the Dutch india, should remind us that the feating drydook is a Dutch invesion, and that many feating docks of this type are built so Dutch ways and towed to their destination. Drydook towing is a specialty, and many foreign-built docks are towed to their destination by Dutch

Sues Casel Traffic.—During the year 1912, 20,275,-120 tone of shipping passed through the Sues Canal, an increase of nearly 2,000,000 tone over the year of as increase of nearly 2,000,000 tons over the year of 1811. The total receipts of \$27,800,000 were the greatent in the history of the casal. During the year 5,373 ships passed through the casal, and of these 3,383 few the British fag. Such figures as these yie ground for the hope that the Panama Casal may become addenuporting and even profitable sooner than some of our statisticians have predicted.

Our Latest Battlestig.—No. 39, the latest battlestig to be built for the U. S. Navy, is about to be laid down at the New York navy yard, Brooklyn. Sister to the "Pennsylvania," she will be the largest and most power-th battleship under construction. The particulars are: Largth, 608 feet; beam, 97 feet; displacement on rail, 31,400 nos. She will have a 14-inch bett, and 18 inches on the, turrets, in which will be carried twelve 14-inch, 45-caliber gun. The complement will num-ber 1,100 officers and men, and the ship will cost, com-Our Latest Battleship .- No. 39, the latest battleship plete, \$16,000,000.

The Engineer-Architect in Ancient Rome.—It was largely their development of the dome and the arched roof in masonry, that enable the Romans to build on a scule of daring and magnificence which has not been ampramed in our modern age of steel. Rosent accurations in Noro's palace have revealed five universances. tions in Nerv's palace have revealed five subterranean vaulted rooms in the proximity of the diffing-room, which were built as fish tanks and used to keep fish alive for the use of the imperial table. The vault and the dome or round roof of the Romans served the purpose of the modern I-beau and latticed roof girder as used by the present-day architect and engineer.

as used by the present-day accusions one engineer.

Progress in Electrifying Steam Railroads—If we beer in mind the many difficult problems and the great too involved in changing from steam to electric operation or railroads, it must be admitted that this country has made great strides in this direction. A recent estimate places the total number of miles of single track that has been obsained from steam to algorith constition. inst has been changed from steam to electric operation at about 1,000 miles, and the same authority finds that approximately 1,500 miles of single railroad track will probably, during the next few years, be subjected to the same change. Too much oredit cannot be given to the New York Central and the New Haven railroads for the ournapous pioneer work which they undertook in this direction. that has been changed from steam to electric operation

Completion of a Great Hydro-Electric Plant-the completion by the Mexican Light and Power the completion by the Mexican Light and Power Company of its light and power plants in Mexico, another great hydro-electife work is about to be put in service. The main power plants have an aggregate capacity of 127,000 horse-power and auxiliary plants at four-sepa-rate points bring up the total horse-power to about 150,000. The work includes large storage reservoirs in the mountains, tunnels through the intervening ridges of rock and transmission lines. The aggregate ridges of rock and transmission ince. The aggregate storage capacity is sufficient to keep the plants in opera-tion for six months without any rainfall. The current will furnish light and gower for the city of Mexico and its capacity is sufficient also to run the trolley systems in the city and the whole Federal district.

and its capacity is entroisent also for in the county systems in the city and the whole Pederal district.

Sees Ties in Europe.—During a recent visit to Europe, the writer was struck with the fact that the steel tie, which has made very little handway in the United States, is extensively used abroad, and particularly in Germanny, where only two years ago the Presiden State Radiways alone purchased over 150,000 tons of ties of this character. We steed on the fine streeted of road between Berlin steel Stamburg, that the steel-tie track was of most receding to the structure and higgmenous; and we were particularly surprised to fluid, their ownersery to the general impression, the bandways and alignment; but was not maken the bandways and analog but were not maken the structure and higher most most structure, but were not more structured to fluid. Their ownersery to the general impression, the bandways and maken the structure and the structure and higher structure of facts more structure of facts and the structure and the stru

#### Electricity

Transatiantic Wireless Communication from Say-ville, Long Island, to Berlin, Germany, has just been established by the German Telefunken System. Messages sent from Sayville on July 12th were clearly received at the Nauen station near Berlin, spanning a distance of 4,000 miles.

Electrolytic Protection Against Boller Corrosion

Silectrigitic Protection Against Boller Corrosion.—
A method of preventing boiler corrosion has recently been developed in which iron anodes are introduced into the boller, and currents are passed from them to the metal parts of the boller. Iron is used for the anodes because it is cheap and because the salk of the anodes because it is cheap and because the salk of the property o negative pole and consequently hydrogen is given off, due to the electrolytic action. This prevents any scale or dirt from forming on the tubes or shell and loosens any adhering foreign matter that may have lodged there prior to the application of the current.

Electric Power Developments in Russia.—It is re-orted that the Russian government has lately granted the rights to English interests for the constr cale riguts to Engine interests for the construction or cleetric stations, using the power of Terek River and Lake Goktoha, together with long power lines running to distant points. First, a temporary plant will be erected on the Terek River near Gvilete village, which rnish 20,000 horse-power, then a permane turbine station on the same stream near the railroad station of Lars, so as to source as much as 50,000 horse-power. Current from these plants will be taken over power lines to Tiflis and Vladikavkas. One or two ulic plants will also be erected on Lake Gokt near the Tarstoha and Akstafa rivers, and these are expected to provide at least 40,000 horse-power. Current will be used in the city of Tiflis. It will be seen that the present project is quite an extensive one

the present project is quite an extensive one
Davice for Detecting Fire Damp. An electric
device which is said to give very good results in
Australian mines for detecting fire damp and marging
an alarm hell, is based on the use of is porous vessel
into which the gas penetrates. The apparatus has a
U-tube containing mercury in the lower part. On one
side is a platinum wire which always remains in contact
with the mercury, while the second branch of the tube
has a platinum point bying above the level of the mercury. Current from the battery and bell comes to the
two platinum points. On the first branch of the tube is
placed a closed, porous vessel, and if there is fire damp
at this soot, the gas posertsets the porous oup and acts at this spot, the gas posetrates the porous cup and ant to horresse the pressure on that side, thus driving down the moroury and causing it to rise in the other branch so as to complete the battery circuit and ring the bell. The contact point is adjusted so that a sufficient proportion of fire damp in the air osuses the moreury to rise to the proper height for making the contact.

Goldschmidt Transatlantic Wireless Exper Goldschmidt Transatiantic Wireless Experiments... The daily papers recently contained reports of wire-less telegraph communications between Neustadt, near Hanover, Germany, and Tuckerton, New Jersey, established under the Goldschmidt system. The re-ports have not been absolutely authenticated. One ports have not been amounted authenticated. One of the principal features of the system is a high fre-quency generator invented by Dr. R. Goldschmidt, which will give 150 kilowatts at a frequency of fifty or sixty thousand oscillations per second. The machine consists of a rotor and stator arranged to give 15,000 consists of a rotor and stator arranged to give 15,000 evolutions per minute. This high frequency current is returned to the stator, producing a rotating field opposite in direction to the rotation of the rotor, thereby producing a frequency of 80,000. This in turn is sent back through the stator, so that it yields 45,000. In this way the frequency may be stepped up to 50,000 oscillations. At the receiving station a fine insuisal note is heard which is readily distinguishable from other signals. The Goldschmidt machine is known as the "singing wheel."

An Electrical Besearch Laberatory and Bureau is to e established at the Massachusetts Institute of Tech-ology. In connection with the laboratory there is nology. In connection with the laboratory more mology. In connection with the laboratory which an endowment of over \$110,000 is assured. Dr. Harold Pender will be the director of the laboratory with H. F. Thomson his moretary and sesistant. The new laboratory as his secretary and assistant. The new laboratory has received an endowment of \$10,000 a year for five years from the American Telephone and Telegraph Company, and \$5,000 a year for five years from an anonymous donor, the latter to be used in determining the distance to which a street car passenger can, with reasonable profit, be carried for a five-cent fare. The laboratory has also received a gift of \$2,000 from the Boston & Maine and the New York, New Havon & Hartford Railroad, for the study of freight handling at ternainels. About a year ago the American Telephone and Telephone a

#### Science

Aerological Observations in Brazil.—Prof. Berson of the Undenberg Observatory recently made a journey to northeastern Brazil to arrange for carrying out a series of upper-air observations in that region, which lies in the zone of the southeast trade-winds.

are ratural filistory Collections of Capt. Scott's Expedition are to be turned over to the Natural History Museum, South Kensington (t. e., the natural history branch of the British Museum). The trustees of the British Museum have agreed to undertake the publication of the natural history results of the expedition.

The German Antarctic Expedition under Lieut. Filchner will not resume operations next season, as had been intended. The Geographische Zeitschrift anounes that the expedition's ship, the 'Deutschland,' is about to return to Germany, marking the end of an enterprise which aroused much patriotic enthusiasm it was undertaken (before the attainment of the pole by Amundsen and Scott), but which has been omewhat disappointing in its results

The Meteorological Service of Russia finds itself in ition, rare in the experience of European scie tific institutions, of having ample funds for its present needs and future development, thanks to a very liberal mcrease in its budget recently authorized by the gov-The buildings of the Central Physical servation, the headquarters of the service in St. Peters-burg, are to be enlarged; a meteorological observatory is to be established immediately at Vladivostok, under which will be organized a network of new Siberian stations; a new aerological observatory is to be erected this year near Paylovsk, and in 1915 serological sections will be added to the observatories at Tiflis, Ekaterinburg and Irkutsk.

Aeronautical Meteorology in France,-The presi of the Meteorological Society of France, Leut.-Col. Rénard, who is more widely known as an aeronaut than as a meteorologist, has addressed a circular letter to the principal meteorological and aeronautical societies and the official meteorological institutes inviting ties and the official meteorological institutes inviting them to send delegates to a conference on the subject of aeronautical meteorology; its objects being to facilitate the utilization by aeronants of the daily weather forecasts and other practical work of meteorologists, and, on the other hand, to encourage aeronauts to make scientific observations during their ascents for the benefit of meteorology.

Papain, the most important chemical constituent of the papays, is the subject of a recent report by the American consul at Colombo, Caylou. Probably few of the travelers in tropical countries who enjoy the melon-like papaya realize that this fruit contains one of the most valuable digestives known to medicine, though the natives of the Orient, especially in southern though the natives of the Orient, especially in southers India and Ceylon, use the fruit almost unversally to prevent dyapopsia. There are several varieties of Caraca papea, and the papain obtained from the different kinds varies accordingly, the best being that derived from the male trees of a shybrid variety occur-ring m Ceylon. The digestive and disintegrating proocoks in Ceylon wrap tough meat in fresh papaya leaves to make it tender, or apply a small quantity leaves to make it tender, or apply a small quantity of the milky juice of the plant to the surface of the meat, or put a piece of the green fruit into the raw curry when the meat will not boil soft. Papain is said to be capable of diseasing ten to twelve times its weight of egg albumen at the temperature of the human body.

The Sounds of Earthquakes, as illustrated in the seismological records of Great Britain, are the subject of an exhaustive memoir by Charles Davison in Besor an exhaustive memoir by Charles Davison in Det-trige zur Geophysik. These sounds are described as variations of heavy rumbling noise, so low in pitch as almost to be more felt than heard (in many cases inaudible to persons who are deaf to very low tones), and belonging to one or another of the following types The passing of wagons, thunder, wind, the fall of a load of stones, the fall of a heavy body, an oxplosion, or some other miscellaneous sound. The oxplosion, or some other miscellaneous sound. shock is felt, in place and time, are particularly intersnock is rett, in piace and time, are particularly inter-esting and significant. In strong earthquakes the sound area occupies a central region (on an average two thirds) of the disturbed region; in moderate earth-quakes the two areas are approximately of the same magnitude; while in many slight earthquakes the sound area is larger than the disturbed area. As a rule the beginning of the sound precedes the shock, and the end of the sound follows the end of the shock. Assuming earthquakes to be caused generally by the slips which constitute the growth of faults, the author points out that the seismic focus in its simplest form must consist of a central region, from which the shook vibrations chiefly come, surrounded, at any rate above and interally, by a marginal region, from which the

## The Salvage and Repair of the Steamship "Royal George"

Converting a Sunken Ship Into a Bubble of Air

By R. G. Skerrett

The reloating and the repair of the stranded steamlet the "Royal George" gives us a strikingly novel example of what compressed air has made possible when skilfully adapted to the needs of a case. This

particular exploit, too, shows the sandhog in a new field of activity—not the tunnel and calsson work with which we have some familiarity.

While outward bound from Montreal for Bristol, the liner "Rayal George," during a dense fog, wont ashore at high tide about aline miles below Quebec. That was upon the Bih of bust November. The ship is a craft of 14,000 tons, had cargo and passengers aboard, and was upon her last homeward trip hefore whiter closed the NI Las rouse to mivigation. At once, local salvage facilities were hastened to the secue and every ordinary effort promptly directed toward the vessel's refunctive.

After nearly two weeks of fruitless striving, it was recognized that the usual salvage procedure and apparatus would use assert, and Mr W. W Woherspoon was sunnound from a nearby wreck upon which he was time canaced—the stranded collier "Gladefone". I'pon the latter he was using compressed alt, and the un derwitlers decided to try the same method upon the "Boyal George," authorizing Mr. Wotherspoon to go ahead. Accordingly, all of the pumps were removed and the hatches to the lamaged compertments soaled by alt-tight plates. All locks were secured to the circular passageway in these metallic intic covers, and concertains also made by high between the air compressors and the lapture holds. In three days tills work was completed and the compressors started at 10 P. M. of November 22nd; iffects minutes here the forward errap space was dry!. It is the retreating to know how this was accommissed.

If was necessary to provide against the pressure of a head of water of twenty-three feet that the compressed air was to offset, and the deek overlying the comparison was not equal to a bared ing stress of this magnitude. Worse will, that deek did not rest upon a solid sile; that deek did not rest upon a solid sile; that deek did not rest upon a solid sele deek, and there was the certain risk of blowing out the calking between the lanks, which would mean failure. To meet the struction, Mr Worterspoon poured not pitch into all the deek seems, covered the deek with a number of layers of far paper, and over these placed a vener of sprace flowing. Then he braced the pressure deek, let us say, by shores reaching to the deek setow, and in this fashion distributed the stress to be absorbed when the holds should be filled with compressed air. In hrief, he turned the dooded cargo spaces into calesons, and then all was hi readiness for the expulsion of the invading water

An internal examination of the injured holds showed that men'r Jorty per cent of the ship's bettom was damaged, but it also demonstrated that the alr-salvage apparatus was equal to the demands to be placed upon it. The next afternoon, two hours before high tide, the water was blown out from the flauded compartments and the vessel floated clear. But this was not the solution of the entire problem.

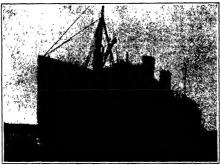
The neutron dry-dock was at Montreal,

The nearest dry-dock was at Montreal, Snowing : 140 miles away, and the river's closed season was drawing near. But, besides this danger of

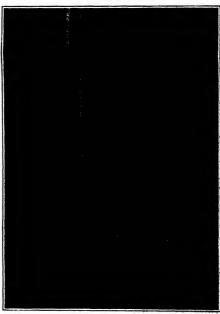
season was drawing near. But, besides this danger of having the ship held for mounts, there was the prospect of heavy dock charges independently of the cost of repairs. There was every reason for haste and economy within reason, but the question was "How could the 'thoyal George' be made ready for see otherwise?" Mr Wotherspoon answered this in a unique and a thoroughly satisfactory mauner. This is the best part of the story.

The ship was anchored out in deep water, and down into the damaged spaces the sand-hogs were sent

through the air-locks—the compartments being held substantially drained by reason of the compressed air within them. Beginning at the uppermost point of the wounds in the ship's steel skin, the sand-logs roughly



The steamship "Royal George" on the rocks in the St. Lawrence River.



Showing how the "Royal George" was salved and repaired without dry-decking.

scaled these openings by covering them with heavy planking calked with mid and caken: the water further receding as the "pude-boards" reached downward and finally covered the openings. So far, so good, but this scaling was but temporary and effective only so long as the afr pressure was mishbathed. Before, the vessel could proceed seaward it would be accessary to cover the damaged bottom from without with sizes plates made water-tight. Blocking, the kines with "podge-boards" wotild seem to have smale this important of the state of the sizes of the state of the state of the state of the sizes with "podge-boards" wotild seem to have smale this important

sible, but there was a way to start the search regions From within, festible templates of word wars made to each needed patch, and upon these wars made to places for bot holes—the same positions being and

cated upon the toner surface of the sealer plating. The templates we small he through the air-locks and guided the similar workers in forming the steel particular size in boring the threaded both theirs. Their these holes trap both were careswall. In the meantime, neightly league, holes were drilled around each wound and sander depit with wooden plans from within. As weighted ladder was awang under the ship and directly beneath the rents to be manded. A diver was sent down what took his place upon-this submerged platform for the purposes of co-operating with the small-hogs within the ship.

When each patch was ready, with its

When each patch was ready, with let tap botts in Jince, it was nowed down to the diver, who merely directed it into peation, the me inside withdrawing the wooden pinns so that the holts could enter their proper holes. Then nuts and washers, with plenty of red lead, were piaced upon the bolts and screwed well kome in order to nake the patch-plate song and water-tight. With this done, the "pudge-boards" were removed and the raged edges of the damaged hull cut away by means of Oyz-acceyiene fames. In this mauner all of the repairs were effected, and the total damage covered an area of 700 square feet.

The "Royal George" left the St. Law-

The "Royal George" left the St. Lawrence for halfars, and on the way emcountered heavy weather at sies, but Mr. Wotherspoon's repairs proved quite equal to the stresses placed upon them. At Halffar, because of the povelty of the work and to satisfy the insurance people, the liner was docked for a brife casmins tion. Everything being found in specified shape, the "Royal George" loaded with cargo and returned to England without further mishap.

#### America's First Safety Exposition

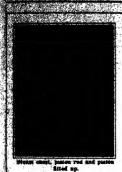
THE First international Exposition of Astrety and Sanitation ever held in America will take piace in New York etty. December 11th to 20th, 1933, under the asuptices of the American Minesum of Safety. Safety and besith in every branch of American Industrial life, naunfacturing, trade, transportation on land and sea, business, confineering, in all of their subdivisions will be represented at this exposition. It will be the first step toward making a representative exhibition of the progress of safety and preventive methods in America.

There will be absolutely no limit to the scope of the exposition. It will embrace, everything devoted to safety, health, smittation, accident prevention, welfare and the advancement of the science of industry.

By a special act of Coogress, exhibits from Europe and other forwign countries are to be admitted feet of duty. European employees have cut their accident and death rate in half by a persistent campaign for safety. There are towasty-continuous of safety in Europe. All of these various nuscenns will contribute be the American exposition.

the American exposition.

In the United States every year 40,000 workput are killed, and 3,000,000 are injused, while 4, 000,000 are injused, while 5, 000,000 are in from preventable causes. A coherentire sections of the water was earlier capacity of the last for one year is from tunded intillin deligner. Thus it can be seen what American the 5,000 accounts in the way of concerving humbs reconstruct. The main object of the Price Instead and State State of the State Concerving humbs reconstruct. The main object of the Price Instead humbs reconstruct. The main object of the Price Instead humbs reconstruct in the way of the the price is to be part the way review instruction; implemited in farty section in it is forgative on industrials with the confidence of industrials and the price in the



### Simple Methods in Modelmaking

How Soft Wood and Cardboard Can be Used

By Percy Collins

It often happens that an inventor cannot afford to have his ideas embodied in a working model by a professional model-maker. How one may make his over model, with solveors and paste, out of such materials as come to hand, is here The methods are capable of many modifications to suit a variety of The machines need not necessarily be very durable, so long as they can be made to operate and demonstrate the correctness of the inventor's theory, or espose serious faults that may be overcome before the patent is applied for .-



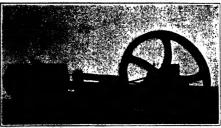
PREED object of this paper is to place before inventors A and others who may be interested, the result of certain experiments in model-making which have been made with cardboard, soft wood and other easily obmined and sadly worked materials. The construction of a model of machinery by the ordinary methods—the various parts being turned or cast in metal—is a lab-ons and often a costly undertaking. This fact is well known that the inventor frequently

hesitates to put his ideas to the prelimin ary test of a model, simply because the outlay which would be involved is beyond his means. Of course many inventors make their own models; but there are ers who cannot do this because they mary practical experie metal work. To these latter the following paragraphs are chiefly addressed. The writer has found, from experience, that many kinds of mechanical movements can be effectively illustrated by means of els made from simple materials that can be obtained practically without exe, and that can be cut and shaped with a sharp knife, a pair of scissors, a die and a sheet of fine glass-paper. The simple methods adopted can be best

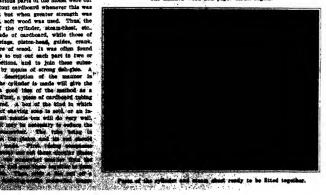
explained by reference to the accompaning photographs which show the model of with the most important details of its coninally made in order to teach some chilthe names of its several parts, was built up entirely from scraps of wood, card-board and pieces of steel knitting-needles. The only exception was the fly-wheel. This (it was an ordinary cast-iron wheel) was purchased at a general store, the co being ten cents. The foundation of the engine was simply an oblong wooden box, in the lid of which two holes were cutone for the fiy-wheel, the other represent-ing the crank-pit. When these holes had been cut out, the lid of the box was screwed permanently into place.

The various parts of the model were cut out in stout cardboard whenever this was feasible; but when greater strength was required, soft wood was used. Thus, the parts of the cylinder, steam-thest, etc., were made of cardboard, while those of the bearings, piston-head, guides, crank, etc., were of wood. It was often found desirable to our our seem part as more sections, and to join these subse-quently by means of strong delegate. A detailed description of the manner is which the ordinate is made will give the I the cylinder is made will give the of a good ties of the institut as a . Size, a good ties of the institut as a . Size, a good ties of carbonard typing spired. A box of the start in which for chartries made to sol, or as in-ments possible box will do year well, the firmer he companity to enter the properties. This tries partie is important. This tries partie is the properties. than the cylinder tube, and give it firmly in an upright position to the piston, using a small piece of cork for support. When the glue is dry, proceed to fit up the cylinder. Two square pieces of card will be required, in one of which a round hole has been bored for the play of the piston-rod. Put the piston rod through this hole, insert the piston into the cylinder, and glue down square cover. The other square of cardiourd should

Parts of the bearings, cross-head and guides.



The finished wood and paper model-engine.



when the glue is quite set, the overlap of both covers should be neatly (rimined away by means of scissors or a sharp knife Therenfler the bands can be glued round the cylinder, and the steam chest cut out and fitted lute place.

All these points are ittustrated in the pholographs

reproduced on this page. But it is mmecessary to de-scribe the whole of the work in detail, chiefly for the reason that the reader will be likely to modify the methods to suit his own convenience. Enough has been this own convenience. Enough has been written to render intelligible the manner in which a model of this kind can be made. One or two points, however, call for emphasis. It is a wise precaution to purchase the fly-wheel before work is com enced, the reason being that the size of the wheel will necessarily be our guide when we plot out the dimensions of the other parts. Once the size of the fly-wheel is known, it is a simple matter to determine the appropriate hore of the cyl-inder, stroke of piston, etc. When making When making the necessary holes in wood or cardboard. the best plan is to use a red-hot kulltingneedle slightly smaller as to size than the bole that we require. The glue used in model-making should be the strongest and best obtainable As to the fluishing of the work, it may be said that each part should be first rubbed down carefully with fine glass-paper, then conted with size, and finally rubbed down again. In this way all rough edges may be removed, and a uniformly smooth surface obtained. This remark will be found to apply as much to cardioard as to wood Lastly, the model should receive a cost of council, which will be found to lie evenly and well upon the sized surface

The full details of the slide-valve and eccentric genr were not attempted in the particular model shown in the photo-graphs. This model was intended to be driven by means of a small electric motor; and as it was to be used merely for oses of elementary Instruction, only sufficient details were reproduced to meel the particular ends in view. But it has been found that a working model cylinder, driven by compressed air, can quite easily be made from cardboard. It need scarcely be added, however, that the internal mechanism of the cylinder and steamchest must be constructed with great care The necessary accuracy metal-like surface may be imparted to the cardboard by rubbing all the fitetion surfaces with blacklend

The render who has followed carefully the instructions given above will find that he is able, after a little practice, to con struct models of many kinds of engines achines by using the simple mate rials which have been meultoned. It is quite possible to make a model factory, with every part of the equipment duly to scale, and all the machinery capable of being shown in motion. One may also e a working miniature of a machine whose movements are too complicated to be demonstrated on a drawing and prove or disprove his theories to his satisfaction.

#### DOILL(11110 Am

#### Federal Regulations for Protection of Migratory Birds

THE Department of Agriculture amounces the selection of fifteen experts to advise the Secretary in randing regulations to make the new Federal protection of migratory birds effective. To these men, who will serve without commercian, will be referred certotic questions arising in connection with the tentative regulations occurity published by the Department in connection with the net of March 4th, which gives the Federal Government Jurisdiction over the migratory birds of the United Nation. The fifteen meselected, and who have already consented to assist in this adsbory equactly, are as follows:

John B Barnham, New York city, president of the American Game Protective and Propagation Associa-tion, chairman; F. W. Chambers, State Fish and Game unisdoner, Sait Lake City, Utah; Prof. L. L. Dyche State Fish and Game Warden, Prutt, Kuns.; W Finley, State Game Warden, Portland, Ore., E. H. For bash, State Graffhologist, Boston, Mass., Dr. George Bird Grinnell, New York, vice-president of the Boom and Creekett Club, and former editor of Forest and stream, Dr William T Hormday, New York, director of the New York Zoological Park, Hon. John F Larcy, Oskuloosa, lowa, author of the Larcy act regulating importation and interstate commerce in lifting and game; Marshall McLenn, New York, chalruna Committee on Conservation of Wild Life of the Camp-Fire Club of America, T Gilbert Pearson, New York secretary Nutlounl Association of Andubon Societies: Hon. George Shiras, 3rd, Washington, D. C., author of the original bill protecting migratory birds; Gen. John C. Speaks, chief warden, Columbus, Ohio; William P Taylor, Berkeley, Cal., chaleman Committee on Convation of Wild life in California; Hon. John H. Wallace. State Game and Fish Commissioner, Montgomery, Ala., Major Bluford Wilson, Springfield, Ili

The proposed regulations, in the that adoption of which and in the heurings on which these gentiemen will set in an advisory capacity to the Department, and which do not go hato effect before October 1st, 1913, are designed to secure the following results

1. Uniformity in protection of migratory game and insectivorous birds in the several States

2. Protection of birds in spring while en route to their nesting grounds and while muting

s. Uniformity in protection of migratury lidres at night.

4. Establishment of protected migration routes along three great rivers in the central United States 5. Complete protection for five years for the smaller

Complete protection for five years for the smaller share birds and other species which have become greatly reduced in numbers

6. Reduction of the open season on migratory game birds, but in most cases not more than 25 to 50 per cent

#### Saving Our Natural Gas

WILAT is believed to be a most notable demonstration of the conservation of the inherent resources of the country has just been accomplished by the United States Ilureau of Mines in the State of Okuhhema

A. J. Pullard of Bisker-field, Cultivaria, and A. J. Heggern of Pittsburgh, Pr., the two oll experts of the Bureau, acting under the direction of Dr. Joseph A. Holmes, have succeeded in stopping the waste of more than 150,000,000 embic feet of matural gas addity. This gas is worth \$37,500 for every day 11 is wasted and men'y \$13,000,000 in a year's time

When the Bureau's experts entered the field it is studied that 250,000,000 cubic feet of gas was being wasted, valued at about \$82,500, for every (wenty-four hours, or about \$23,000,000 a year. All of this will eventually be sweed.

The gas already saved is equivalent in heat value in a year's time to 1.875,000 tons of the heat coal, and before the advent of the Bureau's once Okhdonas was wasting fuel canal to 3.125,000 tons of coal.

The operators and dtillers after much skeptician inversion reacted the conclusion that the Federal experts' method of drilling is the proper one, and they are making preservations to stop the remainder of the waste of natural gas. The necessary apparatus is being an application of the property of the property of the natural property of the property of the property of the interior Equation 11 of the property of the property of the Burean's expects, in Okuhoma mutil more demonstrations can be given.

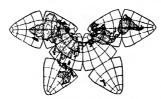
The Federal experts have successfully directed the drilling of two wells in which there would have been a combined waste of more than 20,000,000 cubic fact of natural gas daily under the old methods. They have succeeded in shutting off the gas in these webls and have drilled the well below the gas strain and into the oil. They may also directed the drilling of a number of other wells past the strain and without a waste of any of the gas.

The system to brief justine pumping of a mud-inden

finid into the well in such a mannior that it stops the gas from penetrating the well. In the past it is desired that in a great number of wells drilled in the Custling field in the gas some it has been found impossible to drill cuttrely through the gas formation, due to the pressure and volume of the gas. In a number of instances it has been necessary to shut down the well, and the money spent in drilling has been lost. Loss from this cause in the future will be avoided by the adoption of the system recommended by the Federal experts. It is further chained that the method urged by the toverneam will cost the oil men liess and that there will be less that there will be less right that the method which has been in vogue.

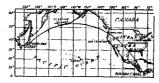
#### Mapping the Sphere on a Plane

C ERHARD KREMER or "Gerardus Mercator," as the fifteenth century mathematician and geographor preferred to be called, conterved a doubtful blessing on the earth when he invented his suffing that with the parallels of latitude intersected at right angles by parallel meridians. His map filled a certain need of his semann, but he could not have done more to confine our filess of geography. Thanks to the Mercator projection, which has found its way late the school of geography. Secanse it shows the whole world in a



The "butterfly map" of the world.

single view, one gets the notion that Canada is twice as bit as the United States, that Greenland is July as Meles, and that Alaska is much larger than Autrilla. As a matter of fact the area of Canada is less than that of the United States, and Africe is much larger than the whole of North America, while Greenland and Alaska combined would not equal half the area of Anstralia. Norway and Sweden, which on the map look like a great less rereging out of the frozen North to gooble up the small States bordering the North Sea, are actually only built the size of the State of Venezuelu in South America. Outside of Russia



The shortest course between the Panama Cangi and Yokohama passes through the Aleutian Islands.

there is not a single country in Europe half us big as Colombia

All our geographical conceptions are due to the fact that the Mercator projection makes it necessary to expand the polar regions of the earth to the full extent of the equator. Not only are our impressions of the relative sizes of land areas greatly distorted, but we are also misled as to the relative positions of various locations and the shortest course to pursue in travel-ing from one point to another. For instance, a schoolboy would tell us that the shortest course between the Panama Canal and Yokohama, Japan, would take us through Hawaii. and you could not make him believe otherwise without showing him a globe and letting him stretch a string from one point to the other, when much to his surprise, he would find that the shortest course would be to travel lanck through the canal to its Atlantic end, taking a northwesterly course that would carry him near Galveston, and up to Portland before he struck the Pacific Ocean, thence up through the Alentian Islands. The accompanying map is a Mercator projection of a part of the earth, the apparently shortest course between the Panema Canal and Yokohama by a dotted line and the really shortest course with a heavy full line. On a globe it is easy to see that the bulke of the earth makes the dotted course considerably longer than that shown to

The whole difficulty like in the second of the surface of a sphere on a plant, which it is disputed that purpose of a sphere on a plant, which it is disputed by language the decision of the sphere o

been developed. It is known as the "butterfly map" and was originated by B. J. S. Cabill, an architect, living in San Francisco Because of this contribution geography, Mr. Cahill has just been elected a fellow of the Royal Geographical Society of London. The may is similar to that of the grange lobes, except that fewer lobes are used, and instead of being connected at the equator, they are connected in the northern temperate one, so that no large body of land, with the exception of one edge of Greenland, is cut by the lines which divide the map into sections. Mr. Cahill originally made this map out of a rubber ball, a couple of inches in diameter. On this he scribed lines of latitude and longitude, 221/2 degrees apart, and drew in the map of congressed, 22% excrees spart, and drew in the map or the world. The equator was represented by a red line, the meridian 23% degrees west of Greenwich by an-other red line that was extended around the earth, and a third red line was put in at right angles to both of these great circles, which would bring it to 1021/2 degrees west of Greenwich. Where these three great circles intersected, the ball was cut with a sharp kuife along each line for a distance of 221% degrees from the point of intersection. This divided the globe into eight equal parts, four north and four south of the The cuts were then continued southward to liberate the four southern lobes, and one of the cub was continued northward so that the globe could be opened out and laid flat, as shown in the illustration No little was the distortion when the globe was flattened out, that even the paint on the surface of the ball did not crack. On releasing the map, it jumped back to its spherical form, becoming a globe again. On examining this man, it is easy to see how much shorter is the course from the Panama Canal to Yoko way of the Alcuttan Islands than by way of Hawaii. The "hutterfy" projection shows how the land radiates from the north pole in three streamers. It represents the best attempt so far to map the globe on a

#### Texas Sulphur

TEXAS is destined to play an important part in the production of sulphur for the world's consumption Beginning on November 19th, 1912, sulphur in paying quantities has been mined from the Freeport Sulphur Company's new field at Bryan Heights, near Freeport, Texas.

This latest large deposit to be worked for commercial and industrial purposes is located about three miles from the mouth of the Bracos River, the largest navigable river west of the Mississippi, and within view of the Guif of Mexico. The sulphur deposit is practically located at title water.

The sulplur at this mine is found under conditions very similar to those existing in Calcasieu Parish, Louisians, which mine was recently fully described in the SCENTIFIC AMERICA.

The area of the Texas deposit is something over 660 acres, and the sulphur content of this mine is probably somewhere in the vicinity of seventeen million

The process of mining used at the Texas field is time of introducing hot water into the formation and reserving the sulphus in a molien state by pumsquire, it to the surface. The batic system of mining by this process was patented by Herman Fresch in 1899, the patents for which expired in 1899. At the Prespect Sulphur Company's min, however, the application of the process differs in some respects from that used by Mr. Franch, and the same results are arrived at by spaceoins different methods.

"Ministrial" to conduct more man ventrouner trans-tion insulations, who has detended to design conducts. The continuer, who has detended to design conducts as the continuer, who has detended to the will be should be to be true to convey steem and water rought the same pipe; and if he wishes a metahotory of sigher divisition in a steem heating system, for mapple, he provides exparator return pipes for the outdisappe, no provision separate retains upon no two out-flowing steam and the returning water of condensa-tion. It is only beginning to appear, however, that the same laws which are recognised for even, air, water, s, hold good also for the flow of human me cules which constitute the elements of the contents of a modern crowded street.

In meatly every large city to-day there appears : tendency to enforce traffic regulations intended to per-mit the most conflicting elements to be operated to gether, and the result is naturally the impeding of the very traffic which it is desired to help.

he very general introduction of electric stre us increase in the number of autoand the transmooth increase in the number of auto-mobiles, might well be supposed to improve the means of setting about, but as these facilities are increased there appears to come with them a continual increase

in plans for reducing their efficiency. Thus, the automobile enables far higher speeds to be Thus, the automobile enables for higher speeds to be statuned, both for persons and for merchandles, than could be secured by the older means of transport. Instead of welcoming and utilizing this advantage, there immediately appears, on the contrary, such speed likeliations and traffic regulations as act to neutralize very largely the great improvement which has been developed. The ostensible reason for such obstructive thods is the safeguarding of the foot passenger; the real reason is the attempt to conduct the modern and the antiquated methods of locomotion upon the san highway, thus impesing upon the machine the limitations of the man.

tions of the man. If such a plan had been tried with the steam rail-way, all the forebodings of the conservative element of the savity misceenth century would have been realized, but foreunately the railways were enabled to use their own right of way, and the advantages of the application

of steam to transport were not lost to society.

If the real capacity of power-propelled machinery is to be gained in transport in cities, there is one funds is to be gained in reasport in cities, there is one ruine-mental condition which must be observed: the segrega-tion of foot and vehicular traffic. This is such a simple and obvious proposition, and has been so suc-cessfully applied in certain isolated cases already, that as most surprising that it has not been put into

Take the foot passengers off the surface of the treets entirely; and leave the highways solely for

tions, so that traffic regulations may be framed for but one kind of transport, thus immensely simplifying this portion of the problem. Since we may assume that, for economic and sanitary reasons, the horse will soon disappear altogether from city limits, the surface of the disappear attogetime from city mints, the entired of the streets would then be used entirely by power-propoled validies, and it becomes necessary to provide elevated sidewalks for the pedestrians. Such elevated sidewalks need not be heavy or costly, and would leave the entire middle of the street open, with possibly open the entire mindle of the street open, with possibly open-ings at points along the building line as well. The pedestrian would thus have a level, continuous walk, bridging all streets, and remaining unobstructed at all points at all times.

The feasibility of such a plan needs no argument; It requires only a visit to any one of the great bridges crossing the East River at New York, or a promonade upon a "boardwalk" at any seakide resort, to speak for

itself. In the city, however, it offers such special ad-vantages as to demand further emphasis.

The provision of a perfectly safe, smooth, and accesswalk, at the first fic or level of all buildings would add immensely to the value of store fronts, and solve many of the problems of shop and residence construction in cities. Many people would gradly walk considerable distances upon such a free and sate path, who now dread the dangers of street crossings. The considerable distances upon such a free and safe pull, who have dread the dangers of street crossings. The removal of the dangers of street crossings. The removal of as important cause of surface congection would partial as jumple greater, freedom of traffic upon the highways, that the sidicatery of automobile vehicles would, but greatly enhanced. The electric cars, given the matter of the street, would define their partial controller in the street, would define the first account the path of the speeding automobile to fine streets as the street, which is the street of the streets of t

side, providing separate conduits for different kinds, sed only application to the flow of people, to permit isir rational and satisfactory operation. An important feature in the possible installation of elevated side walks in a city such as New York, appears in the me per in which it might be constructed gradually as doner in which it might be constructed gradually, as de-manded. Thus, such sidewalks might be built on Broadway from the Battery to Union Square, there sloping down to the surface level until further extenstons were required. As each new section were added, it could be put into immediate use, thus differing from any important construction which cannot be used until wholly completed.

An important extension of the principle, and pos ably one which might be first put into operation, would be the introduction of a system of bridges connecting the upper floors of tall buildings. If, say, at the tenth floor level, the cross streets were spanned by foot bridges of ample width, enabling foot traffic to pass erution would freely along, without descending to the lower levels, there would be a marked relief to the surface congestion. Many people would remain upon the upper levels during the noon hours, taking luncheon at son venient restaurant or club upon the higher floors, and walking a portion of the distance up town at night, and the distribution of elevator service thus effected might be found most advantageous. For many pur-poses such an upper traffic level would increase the poses such an upper trume even would increase the values of the corresponding floors of the buildings, since such upper floors would become another street level for business and for the display of merchandise Aperi from the advantages already enumerated, the

segregation of foot from vehicular traffic upon differvels should lead to further developments been felt by many that the continued construction of tall buildings, both for intenses and for residence, would inevitably result in darkened streets, congested living quarters, and other disadvantages. If, however, the necessity for descending were removed, and the net in the necessity for descending were removed, and the lenst until the more congosted quarters were passed, many of the objections to tall buildings would disappear. The lower floors would follow the tendency aire ady begin ning to appear, and be used for storage, for the hand-ling of heavy merchandise, and similar purposes, freed sadvantages of obstructing foot traffic, whi the facility afforded for free and safe movement ut higher levels for business, shopping, eating, and rest dence, would restore the pedestrian to the brighter purer air, and safer movement formerly enjoyed n the surface

It is possible that, upon some intermediate level, the wing road" in the form of the traveling platform, might follow the general unlift; while more remotely, but yet not beyond practical vision, may appear the coming of serial transport.

One thing must be firmly understood, however, that the principle of absolute segregation of foot travel from kind of vehicles is essential for relief, and thus any plan which proposes to place both automobiles and pedestrians upon the same level, would be fatal to suc-cess. The power vehicles should be kept absolutely to the surface, and there given unrestricted facilities for ed, weight, and numbers; and the fest levels multitained for absolute freedom for pedestrians, with the possible exception of carriages for small children

The resulty of the problem which is already awalting The resulty of the problem which is already awalting solution, will be appreciated when it is understood that u single modern structure, such as the Woolworth Building, New York, contains 10,000 people, the popu-lation of a good-sized town, and that all these people must enter and leave at leave once a day, and many of them more frequently. Such problems of congestion are not to be met by the conciment and enforcement es and regulations restricting and impeding the automobiles or street cars, the very means by which, if unrestricted, much of the traffic might be relieved

Rather, the opportunity for full speed and freedom of movement should be given; as it can be b) taking the foot passenger wholly out of the way, and giving to him also that greater freedom and entire safety to which he is cutitled.

#### The Current Supplement

MUCH evidence points to a point 273 deg Cent. below the freezing point of water as the absolute zero of temperature. Cold approaching this presumably prevalls in interstellar space, and has also been produced in the laboratory. Reflections upon these facts dured in the monotory. Acceptance upon increasing from the subject of an article in this week's beauc of the SCENTURO AMESICAN SUPPLEMENT.—Dr. A. Gleichen writes on "The Human Eye and the Photographic Camera—Points of Similarity and of Difference." An account of the measurement of the luminosity of the glow-worm is given by H. D. Ives and C. W. Jordan, showing that this creature is fifty times more efficient showing that this creature is mry times more enterent than our best light sources.—A laboratory for research in optics and photography, just completed by one of our large manufacturing frame, in described, and the scope of its work outlined.—Food. Haber describes his process for the graphestic production of ammonia.

#### Correspondence

[The editors are not responsible for statements made in the correspondence column. Anonymous communications cannot be considered, but the names of correspondents will be withheld when so desired.]

#### An Opinion on Price Cutting

To the Editor of the SCIENTIFIC AMERICAN: Legislation that looks toward the abolishment of maintenance by the manufacturer is a blow price maintenance by the manufacturer is a blow at legitimate merchandising. It means death to the small retailer and distributer and confiscation to the manufacturer, and is unfair to the public. It fosters and encourages substitution and adultera-Wrong in principle and vicious in practice. S. C. Dobbs, Sales Manager Coca Cola Co.

Atlanta, Ga

#### A Suggestion for Flood Prevention

To the Editor of the Scientific American: Like Mr. F. A. Day of Ohio, I have followed with interest the various articles on flood prevention, and have often wondered why no one mentioned the plan which he suggests in your issue of June 28th. It seems to me by far the most practical plan so far suggested

I am not acquainted with the middle West t extent, but in most places the streams flow through numerous flat meadows admirably adapted to such a scheme, with benefit both to the meadow land and to the country below

Could not Mr Day's plan be improved upon, how count not still the same entirely across the foot of the meadow and providing a suitable culvert in the stream bed of such size as to carry a little more than scream new of semi-mass as to carry a fittle inforestinate the normal flow of water. Then if the stream rose above a certain height the additional flow would spread over the needow until the water had risen to the spillway which would be provided in the top of the dam. In the same way the receding water would flow out gradually till the basin was empty. By providing larger culverts at certain points part only in tunes of extraordinary flows. In this way the entire action could be made automatic, no attendance being required for closing flood gates, etc.
Somthbridge, Mass. H. F. Ammidown.

#### Solar Physics Observatory for New Zealand

To the Editor of the Scientific American It may interest you to know that owing to the generosity of Mr. Thomas Cawthron of Nelson, New caland, a solar physics observatory is to be ere Zealand, a solar physics observatory is to be erected in this part of the world. He has promised to build, equip and cudow a solar physics observatory, at a cost of about ten to twelve thousand pounds. The site will probably be on a summit known as "The Pringe," at an elevation of 2,500 feet above sea-level, and easily accessible. The annual average of direct sundino is 2,500 hours, and the rain register annual average during the past thirty, years is 37,88 faches. Nelson has been termed the climate paradise of New Zealand, and according to Prof. Archibald, the well-known meteorologiest. Nelson is very mitchle for the known meteorologist, Nelson is very suitable for the establishment of a solar observatory.

MARY PROCTOR 159 Collugwood St., Nelson, New Zealand.

#### A Few Words of Appreciation

To the Editor of the SCIENTIFIC AMERICAN

To the follow of the Schritzic American.

I cannot resust the temptation of influeting another letter to let you know how I appreciate some things you have recently published. Some issues back you published a redpe for "Salt-rising Light Bread" that has been worth the subscription price of the Schritzic American for many years to us. In your usane of May 31st you have an article entitled "The Embradery of Knowledge" which I thus! "The Embradery of Knowledge," which I think very appropriate and useful. There is a sontiment gaming ground that the hey should be taught first how to make a dollar and then how to keep it. Now if we become only a nation of money seekers, what will we be but a race of human hogs? All esthetic sentiment and refinement will soon be gone. When wealth is the only object of ambition, any method of obtaining it is countenanced, and so there arise many evil practices among the people. there arise many evil practices among the people.

I have the first astronomy I studied at school with
a frontspiece map giving the sublime home of
the mythological gods. I next got interested in
this matter in the Æneid of Virgil; bave since followed it up in Dante, Shakespeare, Homer, and others, as well as the more prosaic works of Anthon, William Smith, Lempricee, etc. Much pleasure has it given me. The man who wrote that article has my heartfelt thanks and host wishes in all respects. Woodbury, Tenn. W. R. SMITH.



Copyrgan to there and Kwing

1—A conservative, persistent, reserved type.
A good example of hard consistency (Note severity in expression of face; especially of the mouth.)



5—Convex type Artistic in his inclinations and strong in his appetities Interested chiefly in himself



6.—A type which is putient, percistent, in sistent, tenacious, just and deliberating, critical and imaginative. Good example of coacave type (Note prominence of upper forehead and chin)



7—Convex upper and concave lower face. A man who is original, a keen observer, ten-acious, courageous and broad-minded



Photo by Piris MacDonald electrical engi-







Opportunit by its me and Eventy.

8—Declaive. Keen senue of justice. The
vital or judicial type. Not easily convinced
and not easily changed in viewpoint. (Note
roundness of features.)

#### The Scientific Employment of Men

#### Standardizing Human Character

By Herbert Newton

PICK up any dally newspaper published in any large American city and you may read dozens of advertisements worded thus.

WANTED-Batry clerk in receiving department of wholesain drygoods house Not over forty. Must be conscientions, accurate, and experienced. Ad-dress X Y Z., Boz 241. The Planet, Uptown Office.

A hundred applicants write. Those whose letters are least ungrammatical are invited to "call and see our Mr. Jackson between nine and ten o'clock to-more worning." They duly appear. Mr. Jackson looks his men over. The old ones, the shabby ones, the shabby ones, are promptly dismissed. Mr. Jackson may be right or worning in disposing of them thus summarily. The rest he questions. Invariably he asks: "What is your experience?" Finally he elected a man not unattractive in apporance, one who has been in the drygoods

selects a man not unattractive in appearance, one was now seen in the separation business for five years.

Will the man stay in his new pince? Will be be acceptable to his fellow workers? Can be be counted upon in an emergency? Will be have the interests of the house at heart? Only time can tell; not Mr. Jackson.

This is the time-honored "hiring and firing" method-wasteful and expensive. But is there anything better? Is there any way of standardizing men as machines and materials are standardized? Is there my way of specifying human characteristics as accurately as belting and steel are specified for a chine shop?

Business men have thus far interested themseives but little in this matter. Theirs are still the hit and miss methods of antiquity. They try aman for a time, which is equivalent to sampling a patent medicine or demonstrating a machine, and they cherish the illusion that thay are proceeding in a practicel. business-like way.

The alive manager of one large firm once tried three bundred candidates before he succeeded in obtaining an even passably efficient force of twenty-five asis-num. The cost of engangine, partially training, and finally seeding out the 275 unit summand to over \$80,000. This was the actual money lost. The waste of time, energy and enjoyertunity for profitable asise can be scarcely waste; of time, energy and enjoyertunity for profitable asise can be scarcely

Business men forget that the demonstration method is expensive and that Dualness men longer that the demonstration method is expensive and that it may sometimes prove disastrous. Sometimes they try to cast upon another the cost of demonstrating a man's fitness. Hence, it is a common practice to appropriate men who have demonstrated their ability in some enterpriss. Where would the American many be if it attempted to officer its ships by appropriating

would the American navy be it it attempted to onneer its suips by appropriating British, French, and Japanese officers of alkillity?
Selection on a basis of experience (Mr. Jackson's method) is common, but yould pusselization for the prediction of the properties o without aptitude is worth little; and that aptitude without experience may be worth much. Experience is important, but it is easily acquired when there is aptitude, days or weeks giving a profelency not otherwise accumulated in mouths or years. But how can aptitudes be judged? Psychological tests have been advocated, but their application is exceedingly limited. A man is not necessarily a good locomotive engineer because he can distinguish red from gre-because he responds quickly to signals. No psychological instrument ti devised can determine whether he is careful, whether he has press

ideally, an efficient commercial or industrial organization is correctly designed Ideally, an efficient commercial or industrial organization is correctly designed as to functions and their inter-relation. Each individual in the organization, whether executive or subordinate, is fitted by natural aptitudes, training and experience for his function, and all are associated with reference to their common adaptability and harmonious co-operation. Engineers, executives and organizers have worked on the problem of design until it now approaches the ideal. The clarat or organization with line and staff functions devised by Ma. Harrington Emerson and the functional foremanship plan of Mr. Frederick W.

Taylor are eximples. It remained for someone to bring the problem of scientific selection and assignment of employees out of chaos and hapshaard methods into scientific efficiency. This has been and is being done practically in several large commercial organizations, according to a pian originated and made the basis of supplement departments by Dr. Katherine M. H. Blackford.

Dr. Blackford proceeds on the principle that "the largest wass of money, the finest materials, the latest and best equipment, the most cleverty and intelligence."



9—Determined. Liberty-loving. A many ploneer. The motive type. (Note since ness of features with long lines.)



10—A well-known electrical engineer example of the motive type.



on. by Pirty MacDy

11-A well-known engineer of the eam type. Affable, tactful, and popular.





els of the triangular as-eltive. Imaginative.



mir Herbon Beng.

good Stample of Rue texture. Ideal
Hamenitarian. A natural educator
essemple of mental type. (Note tri



de Concert, idealistic type. 4 man who ight ideals were so high that he convert seasing fortune into a trust fund for t coult of his assolopida.

insity derised instancia will not be efficient unless there are most fitted by nature and trializing for their nation, in the 'light places at the right time, and with the next haining, equitance, direction, and supervision." How different a this partial registers are supervised to the manufacturer is prome to place in supervision and to the manufacturer is prome to place in supervision. The manufacturer is prome to place in supervision and to do have to be super that there are more enough to run his middless and to do his work. The the consideration of the relative cost and disclared of two machines he will devote isoancely ten minutes.

3. Be obviously unisidentified to place men and women in an organization with the properties of the control of the employee and of time, energy and psychical impiration of the employee.

out beforease to their finess. It is also deplorably wasteful of time ann money of the employer and of time, energy and psycholal imprintion of the employee. Mr. Harrisgion Emerson has estimated that "the yearly money lost in direct cost on the average mechinist of our 170 her cent efficiency (not by any means as manusal standing) is nearly \$5,000; not counting the lose of profit on output. This loss in efficiency increases as the position becomes one of greater importance." It is but one step in advance to use the cut and try or "thre and fire" method of selection by requiring actual demonstration of fitness ou the part of

r. Bisckford has for thirteen years carefully studied men and won their work, in their amusements, in their mental and physical allments and abnormalities, in their religion, in their social and commercial relationships and in their crimes. She has studied them in all vocations, in all parts of the Usided States and Canada, and, during a four of the world, in eighteen foreign countries. In her files she has details and complete records of her examinations of 15,000 persons, and summarized and classified records of her observations.

As the result of her studies she has devised a scientific method of judging char-As the result of her studies she has devised a scientific method of judging char-ceter, a method which judging caccurate, clear, and easily applicable information as to the requirement—in human aptitudes, trating and experience—of each function in the organization; which provides for the selection of human mate-rial by methods for determining its inhorent and acquired qualities; which can at to intelligent examiners and used in analysis rapidly, unobtrusive it requiring more than passive co-operation on the part of the appliand evitable twelfaring more than passive co-operation on the part or increasing court; and leastly which provides the management of any organization accurate information as a basis for associating workers and executives in such a way as to realise the greatest possible efficiency. True such

The system which she has devised deals entirely with externals. In an intui-

tive way we all recognise the value of external characteristics in judging human capabilities. Even our language indicates it The "roving blue eye" is not an empty phrase. The words "thick skinned" and "thin skinned" council both empty parase. The worse times assigned used that samme common both physical and psychical degrees of sensitivity. The sensitive, delicate minded man usually has a fine textured akin; the coarse-minded man a coarse textured skin. It is an embryological fact that the skin was and is the original sent of all sensations, and that spinal cords and nerves are but modified and specialized inturned skin. Of necessity a man's skin indicates the texture of his brain.

Dr. Biackford holds: "It is a law of human nature having universal application that the size, color, proportion, form, texture, consistency and structure of an object indicate its function and use."

As the result of all her investigations and studies she has determined mon As the result of all ner investigations and studies such as devertinated upon time fundamental physical properties, variations and combinations of which indicate the characteristics not only of fundam beings, but of all other material objects, whether animate or inanimate. These nine fundamental properties are leasure, size, color, form, structure, consistency, proportion, expression and experi-

Each of these nine properties has a distinct manifestation in every perso For example, texture may be fine, medium or coarse. Size may be large or small and all degrees between. Form may be extremely convex in general tendency or extremely concave, with all extremes of convexity and concavity, and with binations of convex and concave features of face and body.

Structure may be slight and delicate, square, bony, and muscular, round and Structure may be slight and delicets, square, bony, and nuncular, round and corpulent, or any degree and combination of these. Consistency may be very bard, very soft, elastic or varying gradation of these. In proportion we find simuse every possible combination of proportions of different parts of the body, head, and face to one another. Expression has almost as many variations as there are people, as does also experience.

Dr. Blackford's Inventigations indicate that each of the nine elements shown

rates is indicative of certain inborn or acquired characteristics of the

For example, she points out, texture is a great classifier of humanity. The individual of fine bair, has textured skin, delicately clisted features, steader, graceful body and limbs, as a general rule, is refined, loves beaut, and grace. and likes work either purely menial in its nature, or offering an opportunity to handle fine, delicate materials and tools. On the other hand, the man with coarse hair, coarse extured skin, and large, arguely formed feature, belies as a general rule to occupations in which strength, vigor, virility, and ability to live and work in the midst of harsh, rough, and unbeautiful conditions are prime

Mark well in this statement, however, the qualifying phrase, "as a general rule." Other elements beeddes texture may modify the final result. Also note well that these are merely suggestive examples of all of the many things that

went that there are merety suggestive examples of all of the many children that texture may indicate in the individual.

Some similarly suggestive indications of the other properties may also be given. In size, men of small stature and light weight are obviously adapted to light work, and work requiring quickness and agility, while men of large stature and heavy weight are adapted to lifting and moving about large and heavy masses of restardal when encoused in theirbeat work.

of material when engaged in physical work.

It is no secret to observant employees of labor that blondes, as a general rule, are changeable, variety lowing, optimistic, and speculative, while brunettee are consistent, riesdy, dependable, serious, and conservative.

Form is evidenced in the shape of the freatures, and of the entire body. It requires no scientist to observe that the greybound is quicker, more responsive, and less enduring than the building. And it turns out, as one might naturally expact, that the man who resembles the greybound in form is quicker, keener, made responsive, and less enduring that the building in derivative of the second s



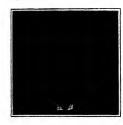
18—The fine textured sensitive artist type. Quick, kind, and responsive.



19 -Russian motive type, of coarse texture; forceful, vigorous, and unrefined



20-An executive of fine texture who wins and holds the loysity of all grades of work-



21-A good example of the promoter type constructive and imaginative



e commercial type—ahrewdness.

## Colonel Goethals' Private Car

of The Yellow Devile's the pet workers have the pixel workers have the rivide motor car of Colonel Goethals. It is apparently a combination of automobile and "dulky," as it has a powerful gas engine with hood like an automobile and a cowacther like a locumotive. It runs on the tracks of the Pannama Rathroad and will take the chief engineer to any part of the rounder of the desired of the pannama Rathroad and will take the chief engineer to any part of the rounder of the desired of the rounder of the seen a powerful searchight, while a similar one is mounted at the reart. This sends its rays to any point that may need special topsection during a night trip.

## Aerial Divers

THE highest point on the face of the earth rises 28,002 feet above the sea This peak of Mont Everest pokes its nose above the life-sustaining stratum of the earth's atmosphere. To reach such an earth's atmosphere. To reach such an elevation, it is quite as necessary to employ oxygen supplying apparatus us it is for the diver who descends into the sea. The highest point ever reached by man without the aid of special breathing apparatus was 8,600 meters or about 28,200 feet. This was on April 18, 1878 when the balloon "Zénith" left La Villette with three passengers aboard and came down e hours later with two of the pas-ters, MM. Sidel and Croce Spinelli, suffocated and Gaston Tissandler all but That record for height has just been broken by a wide margin by the balloon "Icare," which, on May 28th of this year, left Lamotte-Breull, rose to an altitude of over ten thousand meters, or nearly thirty-three thousand feet, coming to the ground five hours later. engers, MM. Hiensimé and Jacqu the passengers, MM. Hemains and Jacques Schneider, were photographed by the third passenger. Albert Hemouque, at the 10,000 meter elevation. The photograph is re-produced herewith, and it shows the seromatus well bundled against the extremely cold weather at that altitude and each fitted with an oxygen-breathing apperatus. Each apparatus consisted of a container for 1,600 liters of compre oxygen, a nose and month attachment con-nected to the container and a means for regulating the feed of oxygen as needed.

## Railway Automobile Newspaper

DURING the Gildden tour from Muniapolis. Minis. to Gincler National
Park, Montana, July 11th to July 10th, a
daily automobile newapurev was printed
on the hotel train of the Great Northern
Italiway, which accompanied the automobile tour to furnish cetting and sleepling accommedations for the motorists.
The newappare plant was installed in a
dynamo baggage cur. The plant included
a libutype machine, a cylinder pross, and
au cugraving outfit. The staff photographer's daily story of the tour was told
with halftones prepared in the engraving
plant. The accompanying photograph
shows the "composing room." To run the
plant a four horse-power moor was used
which obtained its power from the car
dynamo

## A Noise Orchestra

In order to add a touch of realism to moving picture exhibitions, it is enabour ary to punctuate the pictures with the noises one would hear if he saw the same scenes in real life. Herstofore this has been done only occasionally and half-heartedly for the reason that many of the sounds called for were difficult to initiate without special appuratus. However, a machine was demonstrated at the recent moving picture exhibition at Grand Central Palace, whereby any number of different lifelite initiations can be produced by merely straining the proper crusic or pressing the proper pedal. This stagenoise cabinet is the invention of Mr. Samuel Lapin. More than a handred various sounds can be produced. Not only are all sorts of domestic and wild animal calls produced, but also sounds. For instaget, there are fifteen are



The "Yellow Devil," Colonel Goethals' private car.



Photographed in a balloon 33,000 feet above the level of the sea.



Composing room of the railway automobile newspaper plant



Noise orchestra for adding realism to moving picture exhibitions.

different lands of whether the comment was from the whether the control of the co

## Egyption Minerals

A SIDE from its agriculture, attention is being directed to the mineral rich of Egypt, it being naturally asked wheth neath the immence desert tracts extending beyond the Nile valley. A leading French authority Prof. Potier treating in this subject refers to the recent discover of oil fields at German on the coast no the mouth of the Suez Gulf. One so ing operation traversed a 6-inch layer of osokerite at a depth of 250 feet, and within the last few months the petroleum question is quite active. We may men-tion the first boat load of 6,000 tons of di starting from the Red Sea, and new petroleum fields have been lately discov-ered, it is stated, toward the Sinai region. ered, it is stated, toward the Sinai regome-Turning to copper production, Egypt wis-rich in this metal in ancient times, but the mines were of such kind as in the the mines were of such kind as security worked and for this reason now exhausted. Traces of the copper mines have been found, in which the ore took the form of silicate and carbonsti However, a good vein of silic found on the east cost of Sinai peninsus and other deposits are seen in neighboring places. Manganese deposits are observed in this region, and good lead zinc beds as well. Gold is already below taken out at several centers in the ex-treme south of Egypt, and to the south of Assonan there have been lately taken up the ancient gold mines of th of the Ptolemies. On the shore of the Bed Sea at Sukari quartz having three ourses per ton is now worked. Precious stone are represented by emerald, turquoise and peridot. Phosphates seem to be a mere immediate and sure source of wealth for this country, and several beds in the Nife Immendation this country, and several begs in two valley show 70 per cent of phosphases. The richest points, however, seem to be at Rachid in the Takish cesis and at signed out in the Libyan desert, 300 miles from the Nile vailey, but the future extension of the railroad will bring the within reach

## **Dutch Dairy Methods**

THE most minute precautious are used in the model dairy farms man also large centure, in Molland in order to greature miticabeling the greatest degree of the month of the greatest degree of the minute of flood given to the cows and its question of flood given to the cows and its question are food given to the cows and its question roughly or looked after so as to avoid digastive troubles which are known to affect the quality of the milk. Before initiain, the hind parts and todar are carefully weather with the part of the control of the cont

## Inventions New and Interesting

Simple Patent Law; Patent Office News; Notes on Trademarks

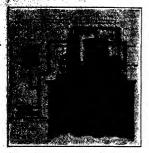


Fig. 1.-Automatically regulated ammonia re-



Pig. 2 .-- Audiffren-Lingrun sulphur dioxide

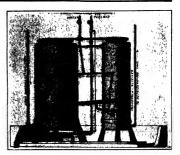


Fig. 3.-Refrigerating machine operated by float-controlled levers

## Befrigerating Machines for the Home

DURING the hot summer mouths the comfort and happiness of residents in suburban and country places are largely dependent upon the visits of the iceman and the inventor who is able to produ a small refrigerating machine which will emancipate these people from their ab-ject dependence is sure of his reward. In o prove a success, such a machin should be us durable and as easily oper ated as the ordinary home steam heating apparatus. Unless the machine can be ly and efficiently operated by the aver-broughold servants it will be impracticable, for the expense of skilled labor would render the use of such a machine prohibitive. Many attempts have been made to produce such a machine, but with varying success, for there are many diffidevice

For this purpose the compression ma-chine probably affords the greatest prom-In this machine there is a cor sor which acts as a pump, drawing in the vapor of the volatile refrigerant on one stroke and compressing it and forcing it into a condenser on the return stroke. take away the heat of the gas due to the on and also the latent heat giver out by the gas when it is converted into a The liquid refrigerant being under high pressure is forced through the exon valve into the refrigerating col or chamber where it evaporates and cools the air or brine in contact with the outer walls of such coil or chamber. As fast as the vapor is given off by the evaporatser and again forced into the condenser where it is liquefied. The volatile refrig-erants generally used in compression maare anhydrous ammonia, carbon dioxide or sulphur dioxide, ammonia hav ing the preference. Where ammonia is used the pressure in the condenser must be maintained at about 175 pounds in er that it may liquely when cooled or of ordinary temperature. With pressure the packings of the com-or must be very tight and on a small like the friction losses are very high-ing the condenser water fail for any length of time, the pressure would rise to a point where some of the pipe connec-tions would be liable to burst and fill the , would be liable to have and fill the so with early furnes of strong an-ing the cogning into very queerl use of the cogning into very queerl use to make an or cooling the large re-resident completed. They give very ma-they make they have been and they make they have been and they make they have been and the

desired. No skilled attendant is required unless in case of emergency.

Fig. 1 shows a small ammoda machine located on the top of the ordinary refrig-erator with the cooling coil located in a tank within the refrigerator. Within the refrigerating chamber is a thermostat which, at a certain low temthermostat which, at a certain low tem-perature, closes and at fixed high tem-perature opens a valve in the cooling water supply pipe. The pressure of this water, by means of a disphragin device, s a switch in the circuit to the elec tric motor which runs the compre Should the water supply be cut off by the thermostatic apparatus or fail for any cause, the lack of pressure under the dia-phragm will open the switch and stop the motor. In this way the machine operates only when there is an adequate supply of cooling water. Of course, much depends paratus, but there appears to be no in-herent difficulty in constructing such devices so that they will perform their func tion properly if given a little intelligent care and attention

At first glance it would appe phur dioxide was peculiarly adapted for on account of the fact that it fiquefies at very much lower pressure than either mmonia or carbon dioxide; still it has one serious defect when used in the conventional form of compression maci The suction pressure must be below that osphere in order that the liquid in the refrigerating coils may evaporate at a sufficiently low temperature to effect refrigeration. With such low pressure als will inevitably leak in, especially through the peckings of the compressor, and in time will render the machine inoperative se the air will not liquely, and th fore its circulation through the mach ot effect any refrigeration. There is canı also danger of brine leaking into the system, and when this happens the machin is apt to be seriously damaged, as th water combines with the gas to form sol-phurous acid, which is very corrosive. However, two Frenchmen have brought out a sulphur-dioxide machine, shown in Fig. 2, in which these difficulties have have never mental and the sulphur-dioxide machine, shown in Fig. 2, in which these dimoutize nave been overcome in a very ingentious way. In this machine all moving parts are con-pletely inclosed in hermetically sealed, des-ings, thus preventing any locationity of air leaking into the aystem. In external ap-penrance this machine resembles a dumb-

condenser, will rotate in cooling water, chinc illustrated, the condenser is in the The two compressor cylinders are made form of an apright tank containing a float. in one heavy piece which is loosely hung on the hollow shaft and the pistons are reciprocated during rotation of the cusing by means of eccentrics fixed on the shuft Ring valves are used to control the suction and discharge.

In operation, the compr the vapor given off by the liquid sulphur dioxide evaporating in the shell B, compress it and discharge it into the shell A where it is cooled and liquefied and again flows back to the shell B to be evaporated. In case the supply of couling water faile from any cause, the pressure rises, but before it can become dangerous the pres-sure overcomes the weight of the compressor cylinders and they rotate with the shell. This means for avoiding high pressure is a very important feature of the machine, for it is infallible in operation and independent of human control. The brine tank may be inclosed in the refriger ator or the cold brine may be pumped through pipes located therein. In case ice is desired it can be obtained by filling small cans with water and placing then cold brine

By actual test it has been shown that these machines are quite efficient and can be run continuously for many years without repairs. As all the moving parts are inclosed the machine is practically "fool proof" and any one with sufficient intelligence to turn on an electric switch and the cooling water can operate it. In case ficient pressure the machine may be operated by a hydraulic motor and the wast water from the motor may be used to coo the condenser. A careful study of this chine will show that it has many excellent features that should make it a and it is believed that the prediction is warranted that when home ic nachines come into general use, they will be of this type. The original putent on this machine has expired and an attractive field is now open to inventors.

Attempts have been made recently to adapt the absorption in use and such a machine is shown in Fig 3 In this type of machine a conden refrigerating coil are used just as in the ssion machine, but in lieu of a compressor a large boller known as the generator-absorber is used. This boller is partially filled with strong aqua am-monia and heat is applied to drive off the leaking into the system. In external 20 month and heat is applied to drive off the and a pair of steel rods, which connec parance this medicine resembles a dumbi-immonda in analytons condition into the ball, with an extension on one cut for a condenser where it liquefles. When prache pairs, This structure rodsic is it ideally all of the ammonia has been exhausting in two separate tanks, is dust pelled, the liqued in the holter is permitted just the extension and the interest of the content of the cut the pendulum lengthens by the covered shell 2, which serves as the to cool dewns, and it then readily absorbed cooling, will be particulty immored in brins; the ammonia waper as fast as it is given before needing rousewal of any parts.

temperature can be maintained as low as while the larger shell A, which acts as the off in the refrigerating colls—in the ma-At the end of the heating period this condenser will be nearly full of liquid ammonly and the float in rising will operate n system of levers to cut off the gas burner under the generator and divert the flow of cooling water from the conden to the generator-absorber. At the end of the absorption period the float in descend-ing will again reverse the valves. The success of this machine also depends upon the automatic apparatus properly performing its function.

## This Push Button "Talks Back"

I T is reported that a patent has been taken out in Norway and applications filed in England and Germany for an electric push button which when pushed has connected with it devices by which the person whose attention it is desired to attract may respond so that the one signaling knows he has been heard and the one being called is saved the annoy-ance of latening to repeated ringings. The result is accomplished by an electric magnet provided with a buzzer and the convenience of the unprevement appeals especially to those who may be summoned during the night, such as physicians and nurses, and should be found useful in conmeetion with call buttons called cannot always monediately respond.

## A Novel Electrical Clock

Daniel, Hrawbaugh, a plonter ceptible inventor, whose activities especially in tolephone lines are well known, in the late sixtles built a clock which is now running at Carlisle, Pa . In the office of his son, Charles H Drawbaugh. The clock has continued to ate since 1870, except when being moved from place to place, and operates without winding. The pendulum, weighing fortyfive pounds, is operated by an ordinary electro-magnet and a permanent magnet armniare, the current in the electro magnet being reversed as it passes the armsture. The buttery consists of a plate of copper and another plate of Iron, which are buried in the earth These plates give a small electro-motive force, and enough current to keep the pendulum swinging A peculiar feature of the clock is the compensated pendulum, which, instead of being in the conventional "gridiron" form, comprises a pair of brass rods and a pair of steel rods, which connect with each other and with the pendulum bob by means of two short levers, so that the bob of the pendulum will be lifted to just the extent the pendulum lengthens by

## Notes for Inventors

A Sliding Racing Shell Seat .-- Adries Gerardin and Charles Sauve of Pembine N. D., have secured a patent, No. 1,058, 855, for a sliding seat for a racing shell with a spring which draws the seat normally toward the bow of the boat, the seat con-tacting with an anvil at the completion of its forward movement.

Phonograph With Disk and Cylinderrhonograph with Disk and Cynneer-record Mechanism.—In patent to Adolph Schwer of Buffalo, N Y., No. 1,058,911, is shown an apparatus in which are com-bined a phonograph disk-record mechanism and a cylinder-record mechanism together with a driving mechanism which may be clutched to either the disk or the evlinder record mechanism as desired

A Coffee Substitute. -John L Keilogg of Battle Creek, Mich , has patented, No. 1,059,471, a coffee substitute in which there is an admixture of a starchy material and syrup which has been beated and coninto and expanded into a puffed, porous mass browned and pulverized, the starch being dextrinized and the syrup being in the form of caramelized sugar

An Electric Washing Machine .- In patont No. 1.059.071, for an electric washing machino, issued to Richard D Robinson of New York city, are included electrones fed from a source of current supply and means for reversing the polarity of the electrodes. In the use of the invention chlorin is utilized as a bleaching element and the chlorin is produced by the dreet action of the current passing between the electrodes

An Inventor Congressman .-- The Official Congressional Directory for the first see of the 63rd Congress, issued April, 1913, contains short biographical notice of the different members of the House and Senate. That of William Henry Wilder, representing the third district of Massaetts, rocites that he was a merchant until 29, manufacturer and inventor, and has had assued to him over 50 patents, also that Mr Wilder is a lawyer and expert in patent matters. He was elected to the 62nd Congress by 130 and the 63rd Congress by 3.203 plurality

Five Can-filling Patents .- Walter J. Phelps of Baltimore, Md, assignor of one half to Frank Gebbie of Rochester, N Y, has seened five patents for can-filling machines or apparatus in which the machines e cans through a small perforation of such a size as to prevent spontaneous ontsuch a size as to prevent spontaneous out-flow of liquid therethrough, the small filling opening being also casily closed by a single small drop of solder, the smaller the open-ing the smaller the drop and less the hability of any of the solder entering the can as a loose globule. The patents include other features and are numbered from 1,058,093 to 1.058.007 inclusive

A Folding Pistol. -- Patent No. 1,059,405 has issued to the Sumplex Arms Manufacturing Company, Denver, Colo., as assignee of Horace M. Sprague, also of Denver, for a pistol in which the barrel is hinged to the handle and is adapted to fold against the handle and the spring-actuated harm-mer in the handle is cocked by the folding barrel, a dog being provided for locking the hammer and a two-part trigger bong carried by the barrel with the lower member of the trigger engaging and tripping the dog to release the bainmer whe

edway, New York city, undertook the Broadway, New York city, ungardox take sweeping of the avenue. At that time the condition of Pennsylvania Avenue, the national parade ground, was such that Mr. Critchenson had to put about one hundred laborers to work eleaning off the nearly foot deep mud before the operation of the

A Collier With Two Hulls,formed with two spaced apart side portions so arranged as to receive between them the ship to be coaled and having a bow portion connecting the side portions and delivery pipes for directing the coal from the side paper for directing the coar roun the side portions into the ship between them, is shown in a patent, No. 1,059,201, to Charles Pacquier of New York city.

Two Nikola Teala Patents.—Teala has secured two patents, No. 1,031,142, for a rotary pump, and the other, No. 1,061,206, for a turbine, both of which include suitfor a turbine, both of which include sulf-able easings with inlet and outlet ports and a plurality of plane surfaces spaced apart. The inventions have already been de-scribed at length in the columns of the SCIENTIFIC AMERICAN.

Show Window and Show Case Improvenent.-Patent No. 1,060,787 to Tron O. Peterson, of New York city, assignor to Store Improvement Company, Inc., of New York, is for an apparatus such as a New York, is for an apparatus such as a store window or show case for exhibiting merchandise which has a transparent par-tition and an opaque partition in front of the transparent partition and extending

both of the transformers and a phase-ad-justing device connected to the autenna-toground circuits

Internal Combustion Engine with De-

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of its stroke, when the infin and the gases are ignited. The power expended in compressing the air in the reservoir is nearly all returned in work performed by the piston in the cylinder mirture of a

## Trade-mark Notes

Oneida Community Tradethe trade-mark case ex porte Oneida Comthe trade-mark case & parts United Com-munity, Lamited, the Commissioner of Pat-enta has held in affirming the decision of the Examiner of Trade-marks refusing to register a certain trade-mark, that when a register a certain trade-mark, toak when a patent showing a certain construction ax-pires, the public has a right to manufacture articles in accordance therewith, and that right cannot be taken away under the guise of a registration of a trade-mark. The trade-mark in question was described as or a registration of a trade-mark. The trade-mark in question was described as "the raised, substantially circular or O-chapped film, having distinct edges appear-ing on the back of the spoon how!" and the refusal of the Examiner of Trade-marks to register the mark was based on the ground that the mark is not a distinct mark of origin and ownership, and he cited several patents to show it to be common to place a film of metal on the back of the bowl of a spoon.

Trade-mark Opposition in Relation to Unfair Competition.—In a recent case of Oliver Chilled Flow Works v. The William J. Oliver Manufacturing Company, the Court of Appeals of the Disto the transparent partition and astending vertically partly scross it, the idea being to retricelly partly scross it, the idea being to retrieve the vertices of the vertices

Converting a Business Cost Into a Dinner host Cost.—Index Kauser of Isulationov, Md., has patented, No. 1,000-942, means by which a husiness or sack cost can be converted into a dinner cost or Tuxedo, induding lapel covers with means whereby they may be conveniently and detachably secured in effecting the conversion of the garment. garment.

A Fessenden Improvement.—In patent No. 1,050,965 Reginald A. Fessenden of Washington, D C, assignor to Samuel M attorney from the Northwest, representing funtrument, several complementary from the Northwest, representing instrument, several complementary from the value of patents said: "Now if pastly of the antenna by employing the our trade-marks my company was at emide as wireless apparatus in which there is underference still, and sewling to decogate outling instrument, several complementary from the value of patents said: "Now if pastly of the antenna by employing the our trade-marks my company would spend influence of different ones of the conductor as million dollars in defending it," as the containing the private of the company was attende-mark ference by the aid of two antenna-to-properties. That it aid valued patent ground circuits each containing the pri-prieparts. That it aid valued patent ground circuits each containing the pri-prieparts. That it aid valued patent ground of the patent is the purshase by the company of the patent is the purshase by the company of the patent is the purshase by the company of the patent is the purshase by the company of the patent is the purshase by the company of the patent is the purshase by the company of the patent is the purshase by the company of the patent is the part of the patent is the patent in the patent is the patent in the patent is the patent in the patent in the patent in the patent is the patent in the pa ground circuits each containing the pri-nary of a transformer with a receiver cir-the purchase by the company of the patent cuit connected through the secondaries to of its opponent in the patent interference suit referred to, which purchase was con-cluded shortly after the remark before

Internal Combustion Engine with Delayed gratient No. 1,064,660 mark Law.—German consists and compared to G. A. Bachmand of Sidell, Ill., above a communitation corn bolder and fastening element in which a pure-tike construction has more of the handle bars bored longitudinally to form a passage for a cord run from it half the pattern severage for the compared and the paws formed to operate element of the pattern severage in severage for the pattern severage in severage has been grateful and providing that eliberate around a package.

An Early Street-sweeping Machine—The Washigmton Ster calls attention to any of February 10th, 1863, fifty years ago telling how Mr. Critchesnon, propertience of the continuation of the gratest provided for the pattern street-sweeping machine which is completed combination when the matter and capital and quotes from its result of February 10th, 1863, fifty years ago telling how Mr. Critchesnon, propertience of street elections of the pattern street-sweeping machine which bere his name and was then in use in the pattern street-sweeping machine which bere his name and was then in use in the pattern street-sweeping machine which bere his name and was then in use in the pattern street-sweeping machine which bere his name and was then in use in the pattern street-sweeping machine which bere his name and was then in use in the pattern street-sweeping machine which bere his name and was then in use in the pattern street-sweeping machine which bere his name and was then in use in the pattern street-sweeping machine which bere his name and was then in use in the pattern street-sweeping machine which bere his name and the pattern street are expensed to the pattern street-sweeping machine which bere his name and was then in use in the pattern street sweeping machine which bere his name and was the machine street the pattern street sweeping machine which the proposed pattern to the pattern street the pattern street sweeping machine which the proposed pattern to the pattern street the pattern stre Changes in Gorman Patent and Trade.

be of come Hune to the new law, by even if they are be of interest t the pro Gorman law

## Legal Note

The Court of Assess on Pe In experie Harbeck, the Appeals of the District of in reversing the decision of in reversing the dec patent, ferring to the Commission the ground that it we invention, the Court said

"It is easy to dispose of a lease of its easy to dispose of a lease of invention is close by advance over the prior are mechanical change apparent in the art. But in the abserpant this conclusion, and then of petentability in close, to be resolved in favor of the s

The Court also said:

Precess and Apparatus,—In Moulton and Jones the Court of Appeals of the Dis-trict of Columbia, in affirming the decision of the Commissioner of Patents, has said: "It is true, of course, that a process and an apparatus or mechanism by which it may be performed may constitute separate in-ventions. It is also true as contended by vontions. It is also true as contended by the appellants, that a process is not anticipated by a peter mechanism by which, with some alterations, it might have been performed. It is not only necessary that the prior patents might have been used to carry out the process, but that such use was either contemplated or would have seen that the contemplated or would have socured in the ordinary mechanical operations of the design of the contemplated or would have nical operation of the device." Also in referring to tion or tan device. Also in reserving to tas putting in operation of a natural law without fully understanding or appreciating the principle or theory of that operation, the Court of Appeals said such person "was entitled to all the direct uses of his invesses.

Patent Adjudications .-- The Con ent. No. 318,705, for process of smelting by an electric surrent, has been held in-fringed in Carborundum Company v. Risouring State of the Carborundum Company v. Risouring State of the Carborundum Company v. Thropp pales, No. 522,505, for apparature for manufacturing automobile times high seen held rold for articipation in Defaults & Thropp Circular Woven The Companity v. Plak Bubber Company, while this Hashroun patent, No. 573,544, for an automobile bumper was held valid and intringed in Turner Bress Works v. Application Stanting in Turner Bress Works v. Application Stanting in Turner Bress Works v. Application Stanting ent, No. 319,795, for process of sm bile bumper was held valid and in in Turner Brass Works v. Appliance Isoturing Company. In Balmer v.S. Manufacturing Company, the Palmer cut, No. 273,995, for apparature for ing tubular Islands, was half into infringed by a masking used by the intringed by a manditic meet by the ant as to warrantic the presenting. Here despends No. 265, 181, for an automobile beard void for land of invention for the prior, and all, figures Contract of the prior, and all, figures Contract of the prior, and all, figures Contracts.

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Selections to despute.

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"Generalmong to a vastoon."
I RESIDIAM—S. P. VIGGEY, P. O. Box
b, Wost End, N. J. The object here is to
orific as semicolase having a strong frame
light construction on which are mounted to
abus as vertical taxe two planes, which are
need to spart, means being provided for prolings the exceptation and for rotating the



NATERALE RESOURCE LIGHT PIXTURE

Highes to a higher or lower position; to pro-vide for housing and concealing the wires in the extensible elements; and to provide a fixture in which elements are adapted to be produced in communications.

of Sinforces to Burneser.
POWDERDID MOLESTER FOOD AND
PROCESSE OF PRODUCTION THE SAME—I.
F. STREES and A. A. CARACCE, Gleichie, Aris.
Address: the foregree: An object here is to provide for producing a powdered-molesses which
may be easily handled and foresported and
which, with neely indefinitely mutil such these
are it is desired to again hard, it to a liquid
state, by the addition of water to be used
to designing collection.

impedat having its entarput hand constructed virth roteins to the capacity sides, to reserve units of the standard ture und a bolt passing theories but handeds and simmered.

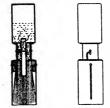
FEOOD GATE.—A. S. Gatenarez, Earter CO., Art. Envention but herere to the properties of the properties of the control of the properties of the



or decreased in length for streams of different sizes, normally in crect position to prevent the passage of live stock, but capable of swinging out of position to permit the passage of drift, and sutomatically returned to position after the passage of the drift.

## Of General Interest.

SHAVING BRUSH.—E. T Karss, Carson City, Nov. One object here is to provide a measuring chamber which, in the normal posi-tion of the parts, is registered with the reac-voir chamber and is filled thereby, and which when registered with the brush to deliver its



SHAVING BRUSH.

PRAVING BRUISH.

SHAVING BRUISH.

COLINICAL CHARGE AND ADDRESS AND



street. W. The efficient of water to be used to finded colds.

STREETS (Common). Otherwise. W. S. Sarm.

M. F. D. The S. Common). Otherwise. An obligation of the infrared an attend from another of the infrared an attend from another of the infrared an attend from another of the infrared an attend from the otherwise. The same of the other than an appear of the infrared and infrared to the inf

APPLIANCE FOR MARINO FLASH-LIGHT
PROTOCOLAPES.—I. D. Little, care of
should also a control to the control of the control position of smilar material at the
frust and adapted to be supported in a borisontal position directly over the front board
of the conners, whereby the shadows around
the figures are to a condidentel extent disininstant and a clear, natural picture produced.
CORNER FIRST.—R. V. Durry, 468 7684
CORNER FIRST.—R. V. Durry, 468 7684
And the purpose is to provide a construction
and the purpose is to provide a construction
which will bind the various hocks forming
the corner property forether and also provide
openings through which bonding mortar may
project.

CIGAR AND CIGARETTE HOLDER — J. Y FRANARDEZ, Camaguey Cuba. The inventior relates generally to cigar and cigarette holder-and more particularly it involves a construc-tion wherein the holder in provided with auto-



or cigaratte. It provides a holder with means whereby the butt may be ejected from the holder who desired. The case oracts with a holder who desired in the season of the brought into the season of t

before reaching the mouth.

See Month and Market and Month and Mon

Blandware and Tools.

WINDOW LOCK.—L. VIOORSERITES, 490 W
1860 R. New York. N. Y. The principal
sign of the York of the Year of the Year
upor and lower sank, whereby the window
may be left upon a certain amount, the construction being such that the lock is not
marked the year of the Year of the Year
MARCH HOLDER.—J. F. O'Mainzy. 14d,
W. 127th 88, New York. N. Y. The holder is
expected while not in use, to allow convenient
permit enter certain the year of the Year
permit enter certain the year of the Year
FILE.—O S NIMMONS. 2047 Ontario St.,
Togs. Philodophia, Pa. This invention refers
to metal working tools and has particular refer
tools used as dise whereby the latter are more
rapid in extrus operations.

than files heretofore constructed.

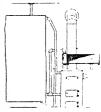
AFFETY RANGE—L. J PAY. Nogales, Ariz
This rasor comprises a hiade holder, a tubular
blade compressor for one in preasing a blade
sagnist the holder and a safety shield separatifrom the compressor and having guard devices, the shield beling movable relatively to
the compressor and from the blade holder



Tu use, if the beard is heavy the first time over it may be shaved with the shield relied and then leweved for tile Bani or close shav extrely removed, thus forming as ordinary or centrely removed, thus forming as ordinary or open rano? The blade may be double open and will be wedge-shape or convex unifaced on both sides.

enting and Lighting

Resisting and Lighting.
INVERSED INCANDERGENT GAS LAMP—W GORLIVERS. Vienna. Austria-Hangary Humerous objections to festure of the in wested insusdevent gas lawn are remedied investion, according to which by a single manipulation of the projecting case all the parts of the hump that require cleaning and changing may be removed as as estimated may be removed as a setting of the properties of the footing manner for hybridization of the properties of the footing manner for hybridizations of the footing manner for hybridizations.



BOT WATER HEATER.

water even in case a large amount is used in a given time, and the waste gases of the hot water beater are utilized to heat the fred water thereof by the preliminary heater, thus requiring comparatively little fuel for quickly heating the water to the desired degree

## Household Pullutes

banting the water to the desired digree.

\*\*Remarked Mullium.\*\*

\*\*ATTACHMENT FOR COUNTRY TYNING.\*\*

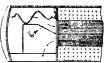
\*\*CRAYAT SERVE OF THE MULLIUM.\*\*

\*\*THE STATEMENT IS PARTICULARLY FOR use with textice, pots and the like provided with built, and the investion provides at careful attachment is particularly for use with textice, pots and the like provided with built, and the investion provides at careful attachment in the country of the months of the investion of the angular texture of the country of the stream of the ceiling of a room as that it will not take up wherein the offen current an opening in the ceiling of a room as that it will not take up wherein the ceiling and the country and to contact the ceiling at the decoration of the ceiling and the controlling to each other, the presence of the hed in discussion of the ceiling and the controlling to each other, the presence of the hed in discussion of the ceiling and the controlling to each other, the presence of the hed in discussion of the ceiling and the wild the ceiling at the controlling to each other, the presence of the hed in discussion of the controlling without reference to the intuibile beams to which the ceiling and the ceiling and the which the ceiling and the controlling without reference to the intuitible beams to which the ceiling and the particular of the suspended barrass and without other fast change, and capable of residence controlling and supposed barrass and without other fast change, and capable of predicts and indistributions user, core and other similar articles, and has for an old-staylor to provide an infarthwitting suger, core and other similar articles, and has for an old-staylor to provide an infarthwitting peace of the ceiling and increase and supposed to provide an infarthwitting suger, core and other similar articles, and has for an old-staylor to provide an in internation peace.

## ues and Mechanical Devices.

Machines and Machanical Devices.
CLITYII E J Swarr. Tamps. Fig. The
invention relates to clutches especially tions
to provide a clutch having destachable bearing
members which may be quickly removed and
replaced when wors. The clutch will autimatically free listif when force is applied to
cause release of engaring members.

cuise frience of engaging members
PASSENGER COUNTING DEVICE - M II
CHAMPTON, 76 Pulton 8t, New York, N Y This
Improvement relates patientists to a structure which will permit ready entrance and
exit and count only the persons entering Tile
object in view is to provide a counting device



PARRENGER COUNTING DEVICE

for street cars, theaters and the like which will permit the ready entrance and still oper only the persons entering. The davice is well designed to take the place of the ordinary turnstile now in nac. A top view of the de-vice shown ou a car, the car being shown in section. Hintariae the invention.

GUMMING AND FILING MACHINE.—A L. Kinkwood. Blocker, Tex Menn, here provide for holding a circular saw in position on

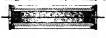


a frame, there being an emery or either sharp-ening wheel revolute, and adjustably mounted on the frame, the atranscende inleng such that the whol when revolving will negage in one that special. Means provide for moring the saw in order to bring rach tooth into sacces-sive engagement with the sharpening wheel Means also provide for dressing the sides of ends to the state of the same to the con-traction of the same to the same to the same side engagement with the sharpening wheel

each modil after the wheel has done its work.

OZONE THOUSENING MACHINE--D. C.

SMITH AND ALL DESCRIPTION OF A MODING, JOWA
AN object of the Invention is to provide a device in which a maximum amount of osone may be produced with a minimum expenditure of energy. The device may be readily as





OZUNE PRODUCING MACHINE

sembled and taken apart for the purposes of cleaning or inspection. Means provide for een-tering the discharge terminals, so that the latter may be at once brought into their proper position. In this device the air is brought under the bannedists influence of an electric glow, and the result is an obuse of exceeding purity

POLIDING UMBRELLA - A SALOF, 125
Franklin Ava. Oakkard, Cal. In little case the
purpose is to provide a sluple, inexpensive,
sastly operated device wherein a frame is provided, consisting of a sectional stick, and
means for holding the sections of the stick in



FOLDING UMBRELLA

read almoment, folding riles having attrebers, and faileding braces, together with a locking mechanism for the attrebers, operated by the braces, and a locking mechanism for the braces operated by the braces, and a locking mechanism for the braces operated by the truner.

ADJUSTABILE PHED OIL HING —C. W. ERENDARN, SAN. W. 30th. 81. Chicago. III. This ring feeding unchanism moneys oil to a shaft bearing, and regulates the annual of oil to be fed to the shaft. By means of this thereby the form of oil to be red to the shaft bearing of oils an attomatically stupped thereby the form of oil for attomatically stupped thereby the form of oils an attomatically stupped per oil of the shaft by the same of the shaft by the same of the shaft by the same of the same

rapid feed of nil
PACKLERRS VALVE—H M ARTZ. Mauslield, and E B Loneszes. Sundusky. Ohlo.
Address H. T. Manset. storney, 1035 Diamond St. Mauslield, Ohlo. The present laves
tion relates to valves, and the particular object is to provide one which naw he opened
and closed in a manuer shuther to tax of the



PACKLESS VALVE

ordinary valve and which will dispense with the necessity of preciting and the stand usually surrounding the valve atom in reciprosality avives. The engraving shows a vertical section through the valve lody, the bounct and the buddle ston.

bandle stom.

ATRACHMENT FOR WINDMILLS 1, it ituazeo, lice 907, Big Spring. Tox Mr ituraceo, lice 907, Big Spring. Tox Mr ituricaon's havenden relates to atturbunets for windmills of that type embodying creak disks or face plates for the purpose of converting reparty motion of the wheel shaft into reciprocating motion for actuating the pit man of the sucker 1998.

MACHINE FOR REMOVING PULP FROM COPFED BEANK.—J. M. UNGRIAS, See Faulo, Brail, N. A. This snackhie removes pulp from coffer leans in a very dimple, effective and economical maker and without lighary to the coffee beans. The pulp passes readily into hollow separators and conveyors to be thrown out of the same at the outer edge by centrifugal force while the machine is running.

fugal force which the machine is running.

JETTINO ATTACEMENT—A. N. RETTING
ATTACEMENT—A. N. RETTING
ALIGNMENT RES. R. Longaph, Mo. The object of
the present patent is to provide a jetting attechnical twishe on he easily attached to the
discharge cityt of beer bettle filters whether
a number of lottles whereby the heer therein
may be agitated in order to expel the air
interview.

may be agitated in order to expet the auliteration.

FATALINI APPLINIS ALE MALINE - W.

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IN A MALINE APPLINIS ALE MALINE ALE MALINE

FATALINE APPLINIS ALE MALINE

FATALINE ALE MALINE

FATALINE

FATA

work it on any height desk GOPHER THALP—A P. RENKEN, Kramer Neb. The trap is substantially rectangular and arranged with trip mechanism an appreci-shle distance from the end designed to exten-te animal, so that the animal engaging the end may be placed into a hole or other place, so as to prevent the animal from secap-ing without passing through the trap.

Prime Movers and Their Acc

Frime Movers and Their Accessories, ROTANY ENGINE,—J. P. NETTLE, Silver-bow, Butte, Mont This invention has for its object to provide a rotary engine with matted wire members, which are referred to as wire with the silver of the results of the silver the cessing in which the cylindrical insusher is disposed for rotating. HEATER FOR NIMOTORS.

disposed for rotating.

HEATRE FOR INJECTORS—II R

HASATRE FOR INJECTORS—II R

HASACHA, 1686 Sixth Are. Huntington, West

Va in the present invention the improvement has reference to injectors, and it has for
its purpose the provision of a bester which
will automatically heat the lajector, when it
is not in use, thereby preventing any freed
fas in the pipes

Mailways and Their Accessories.

AR BRAER—C & Roccianusaru, 2613 80

18th 8t, 8t Joseph, Mo This invention reisles to railway rolling stork and has particulier to freque to a form of hand operated brake
for freight care or the like, whereby the braise
man will have better control of a car, especially in a switch yard where the cars are
being handled in detached relation to the eaorder than the homesform has consisted with



CAR BRAKE FOR PREIGHT CARS.

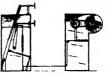
ordinary forms of brakes. The brake or set of brake incelentation can keep a car under practically perfect control of the brakemas when operated either from the bottom of the car as shown in the engresting or from the opposite end at the top where it is customary to locute a brake on a box car. The brakeman can operate it freely by one hand, while hauging upon the car with his feet and the other band and irrespective of the load on the same or adjected car.

same or adjacent car.

CAR BOBB LOVK.—J. B. Daraccol., 28

Flustch 8t, Clifton Forgs, Va. This investor
provides a double locking usons operated by
pressure from the air brake system, so arranged that when the cert is set out on the
dding, the lock belonding thereto is so arranged that the car contains common to tampered with without breaking the lock and
may be operated to release the door by authorled the contains the country of the
may be operated to release the door by authorled persons.

hich are attractive also because of the ele-ents of chance involved. A casing supports series of targets arranged in a horizontal we, and are adapted to be thrown at from distance of, say thirty to fifty feet, and made he held thrown he haves there below



provided at any convenient place, praferably adjacent the players' position, as indicator adapted to operate in accordance with the target struck

Persaining to Vehicles.

VEHICLE RIGN.-V. L. Waldace, care of
Warm Springs Co., Barber Riskop, Reit Lake
(Vig. Utab. In this invention the object is
the provision of a new and improved sign for
use on automobiles and other vehicles so as
and to insure proper illumination of the sign
during the night.

SIGNAL DEPURE

to made

LAMP ATTACHMENT FOR AUTOMO
BILSS.—B. 8 MATHEND, ATOM, Island of
Mashatt, Philippine Islands. The improvement is in isamp attachments for automobiles
and particularly in lamps designed to turn
automatically and light up the road while
rounding curves. When the steering gear is
operated to turn the mechine is one direction
turned to throw the light in the direction of
the curve.

BESSILENT VEHICLE BUNNING GRAB.—

the curve.

RESILERY VEHICLE RUNNING GEAR.

W. H. RROWNING, 18 Cooper Square, New York.

N. Y. The invention provides means for mounting vehicle whoels to permit them to avoid shocks or sudden lift thereof without transmitting the slock or lift to the body of the vehicle, and provides a monning for the vehicle, which will accommedate itself readily to read inequalities and prevent too rapid return or oscillation of the wheel and parts controlled the control of the wheel and parts controlled the control of the wheel and parts controlled the control of the wheel and parts controlled the controlled the

Freum or oscillations of the mean and connected therewith DINN-N. C. Osso, 118
ARTOMORDHOWN N. Y. Osso, 118
ARTOMORDHOWN N. Y. The instinction in this invention is to provide an inexpensive device for producing a warning sound, capable of estachment to any automobile, and in any desired position, which may be operated from the object of whose improvement is the provision of mechanism for industing a series of rapidly succeeding air vibrations, together with merchanism for carbining as and modelating the merchanism for carbining as modulating the the binan roles as modulated by the High.

THEMES BRIVELIA.

the numan voice as modulated by the lips.

PUNNER BHOVEL --A. OPPERMANN, 435 W.

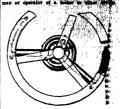
8th 8th 8th Davemport, lows. This invention relates more particularly to power shovels
mounted on a wheeled truck or carriage, and
having means for raising and lowering the
shovel and dumping the scoop forming part of



POWER SHOVEL.

the sloves. The invention comprises a long term observe, on the storest of the slovest of the sl

ranged that the car contents cannot be tamped without hreating the lock as wherein white the car is in the train, the lock and to expected to release the door by author to expected to release the door by author to expect the results of the result



HAND GRIP.

vehicle where the controlling devices are apposed positions; provides an attachment heating the hands under the above condition that he was the same and replaced at from or upon the controlling device; and vides an attachment adapted for install upon standard controlling devices.

WHEEL.—B. BROWN, 40 Whitecross Lordon, Blacked, have is to

WHEEL.—B. BROWN, 40 Whitectees \$\frac{1}{2}\$. London, Biginal. An object here is to pievide a wheel for use on vehicles, whereby \$\frac{1}{2}\$ imparts at the advantages of a posumate or cushion type whose without the disadvan-tages thereof. Another object is to provide roads, or obstructions on the same. AUTOPRIGIA BODX.—J. N. BRAWSTERS, 2828 W. 28d St., Coney Island, N. Y., N. X. This invention Pasitus to cart or wagos holdes and comprises a construction especially adapt-of or use in coal cart bodies for auto treets. In structures of this kind it is essential that as the access as possible to the inachinery of the chassis carrying the body.

## Dealerna

DERIGN FOR A JAR.—D. C. JENKINE, Clease Co., Kokomo, Ind. This new design for a jar has for its most ornamental feature a spirated top for the Id. The jar is slauple, but greeful in outline.

DESIGN FOR A PLATE OR SIMILAR ARTICLE.—E. Roove, East Orange, N. J. The pists is circular and its oransontal feature comprises a design at four equi-distant points of a somewhat strong and very effective pat-

DEBION FOR A COMININD STAND AND RACE DEBION FOR A COMININD STAND AND RACK—C. Dr. Yook Brooklyn, N. Y. In this ornamental design the base holds a bassletil, and a games boy. The stand comprises the best at the handles of which a calendar is strapped and over the ends of the bats a round citoric is sented. Prof. RIGG—W. B. DEBION FOR A Coam. In this design, No. 44,500, the rug hare bread border of several bands of marked variety. A square could be supported by the comprise of the sentence of

DESIGN FOR A CARPET OR RUG .-- H. A. DESIGN FOR A CASPET OR RUG.—H. A. HOWR. Thompsoutile, Cass. In this design the border comprises three bands of different comprises three bands of different comments with up to an intrinsic and bandsously created centerpleto.

DESIGN FOR CARPET OR RUG.—H. A. Hows, Thompsouville, Conn. This commental design for a rufe has a border and field of suited to the comment of the connection of the

NOTE.—Copies of any of these patents will be furnished by the SCHENTIFIC AMBRICAN for ten cents each. Please state the name of the patentee, MtS of the invention, and date of this paper.

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lassified Advertisements thing in this column is 75 sents a line. No 1 four nor more than 18 lines accepted. Count ards to the line. All orders must be accom-

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MEYER & BERWIN.
Rvettore having for sale decommercial value are invia, no estvacce payment r
New York City.

## INQUIRY COLUMN

The Scientific Employment of Mer (Continued from page 62.)
a. An examination of the portraite

of a hundred great generals, pi engineers, explorers, bile racers, aeronauts, and other who lead a life of great activity will she

a general tendency toward structure on the lines of the square—square face, square body, square hands. Reference to the portraits of great judges, financiers, organizers, and com-mercial kings will show a general tendency toward structure upon the lines of the circle—round face, rounded body, and a tendency to roundness in hands and

Anything which is hard in consistency has comparatively great resistance and persistence. That which is clastic in conpersistence. List which is come to have statency is adaptable and seems to have spring, life, and energy within it. That rhich is soft in consistency is pliable an impressionable. These principles have en found to apply to human bein

Relative development or proportion of he different parts of the he organs of the body to one another is, in the eye of a physician, the anatomist, and the expert analyst of human character, as indication as to the relative degrees of the three qualities of energy, vitality, and -and of many other charac

encies show themselves in the expression of the face, quality of voice, gestur walk, clothing, etc. Since the human body is plastic, any emotion, thought, or tend-ency which has become habitual leaves its permanent mark in all the forms of

"Normally," says Mantegazza, "ev thought and emotion takes form in action A transitory emotion has a fugitive ex-pression which leaves no trace, but when it is repeated several times it leaves on the face and other parts of the body an expression which may reveal to us a page of the man's history"

In a similar way, a man's experiences ave their marks upon him.

The foregoing is a summary, greatly abridged, of the indications of each of the nine elements upon which Dr. Blackford and those using her plan base their judgment of qualities and characteristics Far more important however, than any

one of the nine elements is their co tion in the individual. Every individual has his equipment of all nine, and his personality cannot be understood if the significance of even one of the nine is

The importance of this consideration may be made clear by chemical analogy A student of chemistry may learn all th characteristics of oxygen, carbon, and hydrogen, but he may know nothing of the attributes of their many compounds until he has learned the significance of their combination in different proportion

Just as all human beings are combina tions of the nine elements mentionall carbohydrates are combinati

oxygen, hydrogen, and carbon.

Just as carbon, oxygen, and hydroge in one compound give us flery, caustic, and poisonous carbolic acid, and, in different proportions, sweet, healing honey, so the nine elements, combined in certain propor tions, may make of one man a degenerate thief and murderer, and of another patriotic and philanthropic citizen.

The analogy may be carried ever further. Oxygen is a gas lighter than air, colorless, slightly acid in odor and tasts. Hydrogen is also a gas very much lighter than air, colorless, odorless, and ss. Carbon is a solid, and usually hard, dense, and black.

hard, cense, and black.

None of the characteristics of any these three elements are to be found butter, moissess, phenacetin, or peppinint. Tet these three, and these th mini. Let these three and these three only, are in the substition named. In a similar way, combinations of the alone elements of human character in different proportions yield characteristics not hadicated by any one of the nine.



HE highest grade smoking tobacco made-80 cents a pound.

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"EVER-LASTING-LY GOOD"

**STAG** 

## The Motor-driven Commercial Vehicle

This department is devoted to the interests of present and pro

From the Chauffeur's Point of View BELIEVING that not enough attention is being poid to the human elemen in estimating the relative efficiency of the torse and the commercial motor vehicle horse and the commercial motor vehicle, are representative of the Scientific American recently interviewed a number of drivers of a birge department store in New York to get the chauffeur's side of the subject. The following questions were asked one of the drivers of an electric deilvery wagon

- delivery wagon
  Q 11d you ever drive a borse?
  A. Yes, I drave a borse for 7 years before they put me on this truck when the
  store opened—it was about 3 years ago.
- Q. How do you like the motor truck as compared with the horse?

  A. Well, I like it a lot better
- Do the other men like the motor truck as well as the horse

- Truck as well as the norse?

  A. Yes, they all like it.
  Q. Wetl, why do you like it?

  A. When I go up a street, I can get off at my old place and do not have to bother about hitching. I know that if want to stop a minute my wagon 's just as safe as it would be in the stable; there

ls no danger of its running away.

Q. Do you find you can cover more

A. I cover about 40 miles in my ront every day. I go up around through Har lem and I cover just about the same as I used to with a couple of horses (sic!), but they could only go out about 5 day

Don't von find you can cover your ronte quieker

A. No, I don't believe I cover it much quicker. (We are inclined to doubt the accuracy of this answer, particularly in

of the reply to the next question.)

When you get through at night, can't you get to the stable quicker with your truck?

Oh, yes, 1 had to let the horses take their time. I might be several miles away from the stable and then I would to let them rest a little and not kill them, but I can just turn the julce into the old truck and get through in 25 mln-utes or so lustend of more than an hour

How much power do you use on the truck?

A. I figure we use about 5 amperes a mile. There is a "guy" that reads the meter when we go in, and he says the average is about 5 a mile.

Do some drivers get more milenge on the same amount of current

Yes, and there ought to be some prizes for that We can waste the juice then we can save it a lot by constlug tf we want to.

The answer to the last question is unite significant. There is no doubt that the driver can save current If it would pay him to do so. Motormen on many street car lines are awarded premiums for economical use of electricity. How much more important, then, it is to adopt such a system on a motor car which draws its supply not from an addinated store at the central station, but from battery cells of limited capacity.

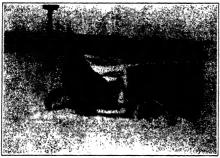
There is no doubt that a driver who is promoted to the position of chauffeur feels the importance of his advancement and does better work. Instead of a merstableman he now becomes an "engineer in fact, we should be inclined to think that it would be advisable where possible to make chauffeurs out of former team sters rather than to hire chauffeurs who had never handled teams; this, of course provided the teams or shows any apti-tude for operating the motor truck. It tos been found that the ex-test

more accustomed to loading and unload-ing the truck, and willing to do his share, whereas the chauffeur may feel that such

## The Motorcycle Truck for Light Deliveries

gasuline. Of course, frequent stops would it is entirely it materially reduce this showing. Thirty-two miles per gallon has been given as a timate, or including the oil sumption, about 60 cents per day of ten bours, covering seventy-five mile This would be about \$16 per month for Deliveries

Rasoline and oil, which is less than the gasoline and oil, which is less than the to make much impression on certain month, while, furthermore, a horse could



Motorcycle truck plowing through snow with a 600-pound load

lines of busine ss, for the reason that the deliveries are light, distances traveled are enough to justify the initial outlay for a motor delivery vehicle. But there is an other competitor of the horse, designed to meet just such a situation. It is the light weight motorcycle truck. The ac-companying photograph shows such a truck manufactured by a motorcycle maker, successfully combating a six-inci maker, successary comparing a six-nen snowfall at a speed of 25 miles per hour. The vehicle is three-wheeled, driving through the single rear wheel This makes it unnecessary to use a differential. reduces weight and does away with cer-tain mechanical weaknesses. The vehicle lilustrated is designed to carry 600 pounds in addition to the driver. The machine to started without raising the rear wheel from the ground, as is usually neces in the standard type of motorcycle. engine does not have to be cranked, but is started by the simple operation of step-ping on a pedal. This enables the driver to stop the engine whenever he leaves the truck to make a delivery, thus saving gasoline, and also conforming to the law in certain localities, without at the same time being put to the inconvenien cranking up his engine. The advantage of a motorcycle for light deliveries lies not only lu the economy of first cost, but

not begin to cover a delivery route of seventy-five miles per day every day of

## Mechanical Loader for Motor Trucks

W ITH the developm mercial motor vehicle to the point where the figuring of maintenance ex-pense is an exact science, attention quire naturally centers around devices that are calculated to reduce idle time by facilitat lng loading and unloading operations.
Unloading, of course, is simplified with the aid of dumping bodies, several representative types of which we lilustrated and described under date of April 26th. During the past twelve months large con-tractors, and, in particular, coal merchants, have in many cases supplemented chairs, have in many cases supplemented their motor truck equipment by the addi-tion of mechanical loaders, and the re-sults have been highly gratifying. One device of the kind is shown in the accompanying illustration in operation loading run of the mine bituminous coal on a motor truck.

The machine is one of several quite similar types that have been developed atming types that have been overly need although the Aussauss are seen as specifically for this kind of work, and as with the auto (but would not be if the may be seen by the picture it is essent United States Army officials were within a may be seen by the picture it is essen-tially a bucket and a chaln conveyor; the elevating gear may be operated either by not only in the economy of first costs, our elevating gent may on operates some size of the date in the fact that it uses very little fuel an electric motor, when a source of currer of the vehicle illustrated can make from cylinder gasoline engine; in the machine forty to forty-five miles on a gailon of illustrated, a zasoline motor is used, and

vating gear consists of two six tachable link belt, to which 18-inch inch malleable iron buckets are at regular intervals; the wh steel truck, the larger wheels of 4 are 60 inches in diameter and the su wheels 20 inches. The machine weighs nearly 5,000 pounds, but two have no difficulty in moving it over h level ground. In some cases the madi are made to be moved by their own po In operation, one man is required look after the loader and to operate The clutch lever which controls the mo The citted lever wated controls the am ment of the buckets is not visible in; pleture, as it is on the other side of machine. After the driver of the tr has placed his vehicle in position un

the chute, both men push coal to the fool of the elevator for a few moments. When the truck is nearly filled, the driver moves it forward in order to fill all parts of the vehicle evenly, and trims the load. Unde service conditions, a two-ton truck has been loaded with chestnut or smaller elast anthracite in less than five minutes; egg and stove coal are loaded in from six to and acove coal are loaded in from an we eight minutes. A special type of loader (illustrated) loads a two-ton truck with bituminous run of the mine or small an-thracite in about two minutes or a five-ten truck in five minutes. As a matter of truck in new minutes. As a matter of fact, it has been found that the machine handles bituminous coal, which lies at a steeper angle than does anthracite and therefore slides down in larger quantities, therefore sinces down in larger quantities, so quickly that it does not pay to have the driver leave his truck; he study! trims the load. The foot of the bucket elevator is movable and the distance from the ground can be changed quickly by means of a crank which operates a worm gear keyed to a shaft which winds or unwinds chains attached to the foot. A fric-tion cintch allows the load to be thrown on after the motor has been started; by means of an extension from the cintch lever, control of the elevating gear is placed in the hands of the driger and it frequently is possible for the driver to operate the machine to load bituminous coal without help. The capacity of the machine is estimated at 60 tons of coal an hour provided a sufficient supply is kept under the foot of the elevato power required to operate it is five !

## Field Kitchens of the N. G. N. Y.

To the Editor of the Scientific American: In your issue of May Slat, 1913, is an article on a Russian auto field kitchen. Although the Russians are ahead of us mile of being up-to-date), I think that the Seventy-first Regiment, N. G. N. Y., was the first to practically use the field kitchen for feeding troops in the field buring the Connecticut maneuvers of 12th, three field kitchens were used, and the Seventy-first Regiment was fed reguiarly and well, white without an excep-tion the infantry regiments under United States Army methods were without food volunteer troops, which or always have to depend up-possible disputes with some ere and the fathering of the parenteet in the party those 1995, this may be all leggle vis. Seeding your troops in



## tille Bedi Malern Gasoline

cientific American eference Book

EDITION OF 1915.

ALBERT A. HOPKINS of 1915 A. HOPK

Wireless Telegraphy and Telephony Simply Explained

The Scientific American Handbook of Travel

With Hint for the Ocean Vorses for European Town, and a Patrick Calabor to Landon and Patric.
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42.50% for faither bases, 12.50% can be the second of the control of the control

The Scientific American Cyclopedia of Formulas

Edited by ALBERT A. HOPICINS. Onnes, 1077

Concrete Pottery and Garden Furniture

RALPH C DAV

Construct from page 26.1 to largestry his industry, his careful-ness, this conscientions accounter, and many other such consiste cannot be de-termined by an observation of any one of these into elements alone, but can be unertingly appraised by careful obser-vation and analysis of the proportion in high the nine elements are con

It is abundantly clear, from the fore sing, that the character analyst who attempted to judge of the qualifications of any applicant for a position merely becaus he was of fine texture and blonde com ne was or nue texture and blondo com-plexion, would go as far wrong as a chem-ist who analysed a carbohydrate quan-titatively for carbon and hydrogen, but neglected to do more than determine the tweepen of overen

or and olive oil have approximately the same proportion each of car-bon and hydrogen, but because of a very slight difference in proportion of oxygen. and in the manner of their combination, one is aromatic, strong to the taste, and poisonous; the other is mild, soothing, and nourishing. So two men may be almost exact counter-parts of each other in texture, size, form, color and consistency, but on account of a difference in proportion. anions, and experience, one will be a lagy, shiftless, careless, irresponsible burupon society, and the other a su

It is well known that certain chemicals unite to form useful substances, and that others units to form sither pusions of actually explosive and destructive substances. It is also well known that ceren seem to co-operate and harmon ise with one another most efficiently, and that certain other men cannot be as ated together without inharmon, more of

Just as chemical analysis enables the experienced chemist to determine which experienced chemist to determine which chemicals he desired to mingle in order to obtain desired results, so the experi-enced ambyst of human character has learned how to associate different types of executives and employees to secure the greatest efficiency.

It is evident that a man or w out unusual gifts can study signs based upon the foregoing nine principles, learn the meaning of their compounds, and become skilled in the selection of men and women for their fitness for functions in an organization the requirements for which have been carefully pre-fetermined.

That this can be done is demonstrated by the success of employment departments installed by Dr. Blackford, and conducted

The conclusions reached by Dr. Blackspeedily and strikingly verified.

When the employment plan was first installed in a certain factory where many electric cranes were in use, and before there had been time to analyse fully the requirements of all the different classes of work, a requisition was received by the employment department for ten crans operators and twelve crane hookers. The assistant who received the requisition telephoned the superintendent to inquire something about the work to be done, and the qualifications necessary for its efficient performance.

ong other things, the superintendent said: "This work is rather danger his fellow workmen seriously injured or killed, so send me men who are very careful."

With this instruction in mind the sastet ant analysed a number of applicants, and from them selected fifteen—the fifteen who, with other requirements, were nat-

from these selected fifteen—the fifteen who, with other requirements, were naturally the most cautious and careful.

Not one of the fifteen, when his prosective duties were explained to him, by the superintendent, would take the jost this offices. They were all so continue these this disease that the prosecution of the prosecution of the prosecution of the prosecution of the process of the prosecution of the prosecution of the process of

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\$3.60 Net HARPER & BROTHERS- from the lamp are absorbed by interposing a protecting acreen between the light and the film. The protecting screen is described as a celluloid sheet coated with a gelatinous

## The Wire Industry

STATISTICS for the wire industry in the United States for 1909 are precented in detail in a bulletin soon to be issued by Director Harris of the Bureau of the Census, Department of Commerce it was prepared under the supervision of William M. Steuart, chief statistician for manufactures

The manufacture of wire in the Unite States is carried on by three classes of ents: (1) Establishments whose principal business is the drawing of wire from rods which are either purchased or transferred from independently operated rading milis of the company, thus includ-ing the detached and independently oper-ated wire milis of companies rolling the wire rods; (2) establishments that roll from and steel, copper or other metals or alloys and maintain wire-drawing departments supplied with rods from the co-operating iolling mills; and (3) establishments whose principal business is the manufacture of some quite different product, but which incidentally draw some wire usually as material for their own con-

There are many establishments which draw no wire, but which manufacture wire goods (fencing, wire cloth, springs (c.) from purchased wire. Such estat lishments are not covered by the censu statistics for the wire industry.

The total number of establishin the United States in the wire industry as whole in 1909 was 93, of which 56 w wire-drawing mills proper which pur chased the wire rods used, 31 were wire departments of rolling mills, and 6 were wire departments of other concerns

The total value of the products of th 13 mills or wire departments was \$180,-083,522, of which \$173,349,014 consisted of wire and products derived therefrom Of this latter amount, 45.7 per cent rep ented the value of products of the wire milis and 50.8 per cent that of the wire departments of rolling mills.

Data regarding the wire industry as at entirety are not available for 1904 and 1809, but an approximate idea of its growth may be gained from the statistics of the production of wire rods of iron and steel. The output of such wire rods in 1899 was 916,587 long tons; in 1904, 1,792.-704 long tons, and in 1909, 2,295,279 long tons, the increase for the decade being 150.4 per cent.

The large plants predominate, especially among the wire departments of rolling mills. The 24 wire departments of rolling mills whose product exceeded \$1,000, 000 in value together contributed \$89, 407,015, or almost one half of the tota of products of the industry.

Of the 93 establishments in the indu in 1909, 59 drew iron and steel wire exclusively, 7 drew copper wire exclusively, 6 drew wire from materials (chief brass) other than from and steel copper, while 21 drew wire from two or more of the metals. A large proportion the establishments manufactured wir natis, barbed wire, woven wire, and othe icts for which plain wire is the prin cipal material.

Of the total expen s reported by wir of the total expenses reputed by man-nills in 1909, satarles represented 2.8 per cent; wages, 13.3 per cent; cost of mate-rials, 78.2 per cent; and miscellaneous exenses, 5.7 per cent.

The cost of materials in 1909 repr ed 71.7 per cent of the total value of pro-ducts, and the value added by manufacture, 28.8 per cent.

The total number of persons engaged in whre mills in 1909 (not including the wire departments of rolling mills) was 19,945, of whom 18,084, or 90.7 per cent, were

A Rapid Service Life-heat System.—In a patent, No. 1.062.637, Melvin D. Conklin, of New York city, prevides for the beart of the city, has been engaged for rapid launching of life-boots by means of a the obsasion.

life-boat track which extends from the d down alongside the vessel to the water line and is so supported that it may be swung on extending transver from the vessel to one lying against the side of the vessel.

## French Fisheries on the Newfound land Banks

T WO recent consular reports from St Pierre call attention to the many in teresting and unique features of the Brench fisheries on the Newfoundland Banks. This industry is more than 400 years old, and has changed but little with the progress of the centuries. The only ortant innovation was the substitution of light deries for the clumsy "chaloup in use prior to 1865. It is true that with-in the past five years the steam trawler in the past my years the seam travies has appeared as a rival, but not yet a dangerous rival, of the brig and schooner. In 1912, 240 vessels and 6,888 men en-

gaged in the Banks fisheries constituted what is known as the "metropolitan fleet, i. e., vessels fitted out in Normandy and Brittany. These vessels leave France in late March or early April and require from 14 to 45 days for the passage, according to wind and weather. The voycording to wind and weather. The voy-age is perilous, for the craft are very small and the methods of navigation are of the simplest. The masters of these vessels take observations for latitude, but have no chronometers and cannot deter-mine their longitude with any accuracy. On the outward journey they can tell roughly from soundings when they have arrived at the Banks; returning they can estimate their position when they cross the steamer lanes converging toward the English Channel. Besides the metropolitan fleet, a cer-

tain number of vessels (40 in 1912) are fitted out in the colony of St. Pierre and Miquelou and manned with Normans and herefore and manner with normans and Herefore who come out in the spring or a steamer chartered for the purpose and return to France at the end of the season Formerly these men made the journey in stilling resents, which were often danger-ously crowded. The combined fleet in 1912 numbered 7.500 fishermen

The fishermen do not work for wage out for a share in the catch. Before they leave France they receive an advance payment, varying from \$75 to \$150, to be deducted from their future earnings. If, as not infrequently happens, a man's share at the end of the season is not sufficient to cover the amount advanced to him, the owner of the vessel loses the difference, and the man himself comes homwith empty pockets. The fisherman's total earnings in seven months of hard labor and exposure probably do not aver-age more than \$150. Strangely enough, age more than \$100. Strangery enough, the men appear to be content with their lot, and all the reforms that have been effected toward improving their wages and the conditions under which they labor have been initiated by naval officers, administrative officials, culliphened ship-may be the second of the second of the Science of the Sc owners, and persons engaged in the Sc ciété des Oeuvres de Mer.

## The American Mining Congress

MANUFACTURERS of mining machin-ery, rescue and first ald apparatus and safety appliances are to be given an and safety appriances are to be given an opportunity to display their wares before the mining men of the country at a great industrial exposition to be held under the auspices of the American Mining Con gress, in Philadelphia, Pa., the week of October 20th.

This exposition, the first of its kind in this country, will be held in conju with the annual convention of the Mining perted to attract thousands of interested pected to attract thousands of interested men. It will be entirely national in scope, the motal mining interests of the West to be as fully represented as the coal sub-ing of the East. In fact, there is a tests-tive plan to have a gold mining cump in full operation with a mill crushing the ore. Heyricultural Bail, the beligner blee of its hind in Philadelphie, attented in the

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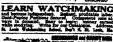
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## Cadillac two-speed direct drive axle

The advantages of this ask do not lie in its being an Improvement to far its functions as an usit are voucerated by rather in the mailfold advantages attained to other directions through the medium of the ask and the second of the second of



os range from about 3,5 to 1 down o 4 to 1 according to the car An, single gear ratio is necessarily wha t is because a single gear ratio mus se, or should be, the particular on which is bust adapted for all aroun

general use

No one single gear ratio can possibly be just right for all speeds are for all conditions. But by using which generally support to the condition of the condition we have exactly doubled the means for promoting the economical and efficient application or power developed by the eagine to the

in the new Cadiliac axie we have, as before stated, two direct drive gear ratios. The low direct drive lapted for city driving, where starting.

anopous and works the result of the control of the

convenient electric switch could be primarily in the fact that with it, any given speed of the engine produces an increase of about 42 per cm in the speed of the car. For example at an engine speed of 10x4 per revolutions per minute with the low direct gear engaged, the car will revolute approximately 21 miles per bour; while on the high direct gear it will travel approximately 20 miles per hour; while on the high direct gear it will travel approximately 30 miles per hour; while on the high direct gear it will travel approximately 30 miles per hour; while on the high direct gear it will travel.

This goes there's a fecture in the relation to engue special excompanion.

Among there is a decrease in gasoline consumption for a given mileace.

This is due to the fact that with the engine turning over slowly—comparatively
gooding—a five quantity of gas is utilised to greater odvatage and greener
more actual power than with the engine turning over more rapidit. Friction
more actual power than with the engine turning over more rapidit. Friction
more actual power to be a some control of the cont

Another great advantage is that with this direct drive high gear ratio, then is obtained an extraordinarily invarious smoothness in running, together with marked quietness and a comparative freedom from the vibration which, to greater or less extent, is ever present when traveling at high speed with a low-cast ratio.

to the power plant which make for greater fuel contents instead or assuing computations to the power plant which make for greater fuel consumption and for greater upkeep expense, they have been attained by methods which are strikingly the reverse, via. by methods which leaves the fuel consumption, pethods which decrease friction with its resulting wear and methods which make for ionger-life, the copyright with an appreciable decrease in the cost of operation and maintenance.

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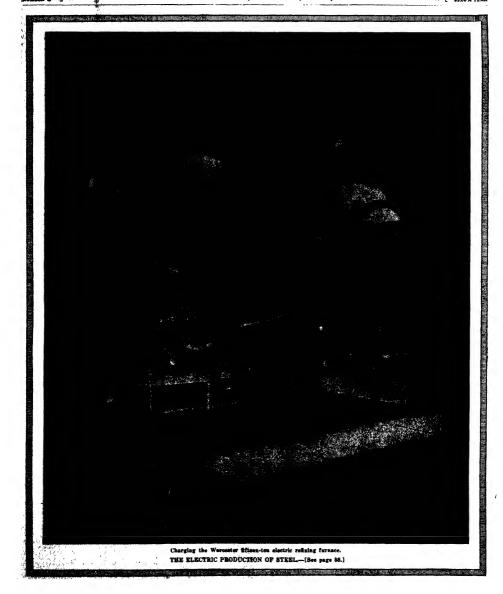
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## SCIENTIFIC AMERICAN

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The Editor is always glad to receive for examination illustrated articles on subjects of limely interest. If the photographs are shirty the articles short, and the facts suffestie, the contributions will receive special attention Accepted articles will be paid for all

The purpose of this journal is to record accurately, simply, and interestingly, the world's progress tific knowledge and industrial achievement.

## Torpedo Tubes But No Torpedoe

TRLIC attention has main been directed to the very serious insufficiency of the torpedo supply of our Navy. Congressman Britten, a memor of the House Naval Committee, has recently stated that if war were begun to-morrow, we would be in a sorry plight so far as torpedo defense is concern some of the torpedo bont destroyers in commission carrying only sufficient torpedoes on loard to fire one round from their tubes. Again, Capt. Sims of the Navy has recently stated that, although there has be pended about \$50,000,000 on our present fleet of destroyers and submarines, we have not more than one torpedo for each tabe; and the same authority tells us that the situation, in the event of a serious war, would ere similar to that of an army marching to battle with one cartridge in each soldier's rifle, or a fleet steaming to meet the enemy with one projectile for each of its guns

Now in the face of this shortage-und it has be known now for several years, known in every mavy of the world-it should be one of the first acts of Cor gress to make the appropriations accessary for doubling the capacity of the naval torpedo factors at Newsort. and for the immediate purchase of torpedoes in s cient numbers to bring our supply on hand up to the required standard. At present, we have about 1,000 torpedoes on hand, whereas the principal foreign navtes, according to Cupt. Sims, have from 6,000 to 10,000 very member of Congress, he he big-navy or little-navy, battleship or no-battleship to bis attitude will realize that the first thing to do and the least that can be done, is to make an carty appropriation to bring such battleships, torpedo boats and submarines, as already possess, up to their full fighting efficiency.

## Another Call for the Fireproof Stairway

IAGHTED eigarette, un abuudance of combus the fabric, and a first-rap stativary, appear to have been the contributory causes of another fre-horror-this time at Binghamton, New With the appeals of the victims of the Triangle fire to this city still in the public ears, there come the eries of over half a hundred girl victims of another fire, calling for stern legislative action to render a further repetition of such a ghirstly disaster impossible.

When the fire broke out, there was a certain amount

of panic of course; there always will be in a factory In the construction of such hulldings this fact should always be kept in view. The means of egress should be umple, and those for descent to the street, whether by elevator or statrwny, or both, should be such that when the inmates of any floor have made their escape from the main building. they will be sure of gaining the ground in safety.

Now the only sure way to seeme these conditions, as

we pointed out after the Triangle fire, and many times in years preceding that disaster, would be to construct both elevators and stairways, or at least the stairways in a separate fireproof shaft or well, built exterior to the mulu wall and having no direct openings from itself the mini wan and naving to direct openings from their to the various floors. The complete exclusion of dame and smoke from the stairway would be secured by placing the doors leading to the stairway at the various

floors, outside the stairway shaft, with concrete or iron platforms leading from the main building to these doorways. A firsproof, inclosed stairway of this character, built external to the main walls of the factory, would have reduced the terrible list of fatalities at Singham ton and possibly would have enabled every issuate to

escape.

The majority of the so-called fireproof stairways in existing buildings are such only in name. To build a stairway of incombustible material is not sufficient to render it fireproof in the sense that it will present to request to report in the sense that it will peecent as as fee means of exit from the building. A stalway is fireproof in this sense only if the construction is such as to exclude the sufficient games, which are the most fruitful cause of death in conflagrations. It should be better understood than it is that of the people killed in fires, the great majority die, not by actual contact with the fiames, but through suffocation by inhaling the products of combustion. A notable case of as the fire about ten years ago in the Park Avenue Hotel, this city, in which the majority of the vic-tims were not even scorched by the fire. Now when the doors leading to the so-called fireproof stnirways, open directly from each floor onto that stairway, the latter is timble to serve merely as a big vertical flue, which, when the doors are opened, is liable to draw the smoke and gases into itself, and render the stairway impassable, except at risk of quick suffocation. In son of the latest buildings such stairway wells, entered from the outside of the building, are built within the from the outside or the duffering, are built within the building lines. The better and safer construction is to form the well outside of the building; this for the rea-son that the entrances at the different levels are farther removed from the rising columns of smoke and gases.

## Vitalism and Mechanism

THE camp of biologists is divided. There are those who hold that the phenomena of life involve a separate principle which does not operate in non-living matter. Another school seeks to interpret all actions or functions of the living organisms in term of the general laws of nature which to all matter living or dead.

To us it appears premature to take any side in this dispute. There is a very wise principle current among scientific men, that the aid of a new hypothesis shall scientific men, that the and or a new mypornesis somit not be invoked, so long as a given set of phenomena can be explained without it. It is therefore clearly the best policy in the investigation of life phenomena, to press forward as far as we can by the application of the methods and principles with which we are familiar in the physical world in general, and to see just how much of the renarkable phenomena presented by living matter we can explain in terms of such general laws, matter we can explain in terms of such general laws, before we attack the question whether, after all his been done in the way indicated, there still remains a certain reddam of facts which cannot be accounted for in this way, and for the explanation of which we must justifies some special "vital principle" or what-ever we may like to call it. This course is christonic from four may be called the state of the course of christonic free from any possible objection. It denies nothing It makes no assertions as to what can or cannot be It proposes simply to continue work along lines which have proved most fruitful in other direction and which have begun to bear very valuable fruit in the special field of blology also,

The work of 1rof. Leduc may to some appear to have fittle bearing upon life phenomena. His adversar nave intro ogering upon me passionena. It is adversar-ies may see in his experiments a mere accidental re-semblance to certain appearances observed in the living world. While this criticism may possibly not be sito-getter unfounded as regards some of his experiments, tn the case of others the burden of proof lies heavily upon the critics. And in any case, the work of Leduc will have furnished interesting and important data on

will have furnished interesting and important data on hydred questions, even if we utterly diverged its pos-sible or probable bearing upon life phenomena. Upon another page we bring in this lesue a review of 1 rof Ledne's work "Synthetic Biology," and some additional data of his researches with be found in this week's lesue of the Selectives American Supplement. The French savant's investigations relate more parties tarty to effects observed in the purely physical world, resembling and, in Leduc's ordinion, identical with the phenomenon which biologists have termed chemotaxis. This term is employed to designate the property pos-This term is compayed to temporate the property pos-sessed by certain organisms of being attracted or re-pelled by certain chemical substances introduced into the water in which such organisms are floating freely.

To the nalve observer these organisms appear to be guided by some sort of intelligence to seek out certain materials and to shun others. To ascribe in to lowly organisms of this character is in itself a very doubtful proceeding. It becomes still more doubtful when it is shown, as brought out most clearly in Prof. need to shows, as brought out most clearly in Frot. Ledic's work, that precisely the same faind of behavior is displayed by purely inorganic substances. Particu-larly instructive is an experiment described by the French biologist, in which a roll which has been dipped in alcohol is breagate to writing a termine of a from the surface of water consisting a seek of ink. The vapor of the alcohol cases in contact the water and cases the India, the of the same the point affected. To express surface point affected. To express surface point affected. To express surface for surface might be said that the India has "seek" in a

might be said that the arous constant and Leduc suggests that our somes of small and based on just this kind of action.

The line of experiment fedured by Frigit Lad one which bears great promise of imperitual fulfactioners. We have here a young branches of and it is the young branches which grow most said

## An Epochal Achievement in the Electrical Arts

NE of the latest, and certainly one of the most important applications of electricity to the dustrial arts, is the use of the electric ours

for the refining of sices in large commercial quantifies such as are called for by the beavy riseds. This do no improvement whose far-reaching importance has inhibato been appreciated only by those which are interested in the theory and practice of sied 'minuthippes. The introduction of the Reseauer converter make it possible to manufacture steel in large quantificities at a low cost, and laid the foundation of the special ties at a low cost, and laid the foundation of the special form the time when the Beassens' converter was made a practical success flown to the present day, the principal efforts of the special palace have been directled to removing certain impairities and defloral which are inseparable from the Beassens' possess. The Blemsmartin open-hearth furnace was the first successful. marin open-neurn rurance was the nryt successful competitor on a large scale with the Resement converter, and the open-hearth treatment has sendered it possible to turn out steel in equal quantities, of a superior purity, and for a signify greater cost than by the older method. . ..

There has always been a market for a special steel casessing in the highest degree the purity, homogen eous structure, and relative hardness and toughness, which are necessary when steel is to be subjected to which are necessary when steel his to be subjected to the most severe mass, and for bandy deededs a limited sincent of such steel has been made by what is known as the crucible process. But this process has always been and is to-day a coetty one, and its product is coverently and if it output to limited, as to reader life wholesale use for the production of chasp steel such as used for rails, bridge work and in the bearier steel such trades, quite out of the question,

arching for some new method that would combine the capacity of the converter and the open-hearth furnace with the purity of the product of the crucible, it was inevitable that the thoughts of the steel maker ould turn to the electric current; and over thirt; years ago Slemens made some practical experiments on a small scale, by which he succeeded in making limited years ago Nieunens made some practical experiments on a small scale, by which is succeeded in making limited quantities of steel baying, per of the electric arc. The very littereding development of his lawention, as sketched out elsewhere in this issue, shows that the suc-cess of this method on a commercial scale was merely a question of the progress of electric eighteering. This development has been as markle, and the results already achieved are so fail of promise, that the introduction of the electrical refluing of steel can be said to mark an exact in the history of the art, measurable in im-portance to the advent of the Bessemer converter and the open-hearth furnace. During a single decade electric refluing furnace has increas ed in capacity from two or three tons to thirty tons, and the present anumal output has reached in round numbers about 1,800,000

The significance of these figures can scarcely be over-The significance of these figures can scarceap no over-crimated. They mean that the day is within sight when, at a cost not very much greater than the present cost of Bessener and open-hearth rails, after fails, for instance, will be supplied which will possess the wear-ing qualities and the toughness to enable thep to stend up under the heavy wheel loads of American traffic.

even during the low tagniferatures of the winter season.

For the present, electrically reduced steal, though far,
cheaper than crucible steel, will of course be considerroot to breast, executasity remark steel, though far chespor than cruellies steel, will of course be considerably dearer than Bessesser and open-hearth. The promise of the future as reparts the levistics of the cost of the new steel lies in the fact that is the sperition of the Herouti fraincas, which bids fair to gain exclusive control of the field, there is still important economic fact, that the larger the furnasce the less is the cost of reduing. Furthermore, there is mobility in the construction or principles of operations of this time account fact, that the larger the furnasce is a local to the large open-hearth furnasces. All 500 ton capacity move in usa. There are electrical-steel furnasces of 115 fain capacity working successfully in this popular, and others of 35 tons are planned. In Germany 30-ion furnasces, also within a few years' time, thanks to this deared application of the second original, and of the very highest quality will be averable as appointed seek and in any decisived quantity.

There there there is no high explosive, trotal, remaining in a light despise the descinable excities of a large transport and demonstrated in a large transport and demonstrated. It is the arcmitist of Lieux Expent C. Woodward of the Light Engineers, Systemal Guard Meer York. The experts, right is on the demonstrat only by Fathinates of amounts, the bess fired in a 12-fank shell against arrows the transport of the supplication of the column that is outnooned transport in the supplicity. It is defined that it outnooned transport in the control of 13 cames of dynamics.

recent problem the works of 12 connects or quantum.

Triging 'the Beam's, Spinel Cat,—In tenting out the steel one worth it wisters to quoving in indestructibility by five, by the problem of the proble

States. Wassings to Shipping.—Recently the Navy and Agricultural departments inaugurated a wiseless saving, by which sterm warnings and weather forceasts for ships at see will be sent out, the service conditions one hundred miles offshore throughout the first length, of the Atlantic const. The message will be used from the naval wireless stations at Radio, Va., and Key West, Fla. They will reach ships distant reversely hindred miles at see, a tring them the forceast of the weather for forty-eight hours, with special warning

Lessmeitre Size Limited by the Fireman.—We are informed by the Baldwin Locomotive Company that today the fastor determining the size and power of large locomotives is the physical endurance of the of large locomotives is the physical endurance of the festman, and that an ordinary fireman cannot put in the firebox more than five to six thousand pounds of coal an hour. This is one of the considerations which render compounding and superbesting, which together, under favorable conditions, secure as much as 40 per cent. commonly in the fuel burned for a given output, such valuable factors in the development of the loco-

motive.

New Mary Yard Proposed at New York.—The House Naval Committee investigated, last week, the proposal of Casyl. Louis S. Van Dusse, made when he was captain, of the Naval Case, and the Samuel Casyl. Louis S. Van Dusse, made when he was captain of the Naval Law Case, and the Community of the Naval Case, and the Naval C

and submarines.

Cost Yesusa Cleaniliness.—In the litigation over the question of polluting New York harbor with New Jorey sewages, New Jersey has at last come to the conviction that the cleanilines involved in the plans for sewage investment is well worth the proposed expenditure of money. Under the plan proposed, the sawage after treatment can be discharged into the New Jersey tidal waters without injury or offense either to New Jersey or New York. The question is one of public health and, as such, it is one of the most important of the many similar questions which are now before municipalities in various parts of the United Steep.

before municipalities in various parts of the United States.

To Beentify the Panama Causl.—There is happily a growing tendency to seek the collaboration of the architect and the actist in giving such beauty to engineering works as the conditions will allow. This is particularly true in regard to the dame and reservoire of water ways and works for water upply, and excellent results have been obtained in the treatment of cortain of the great dame, such, for instance, as that for the supply of New York at Croion and of Beston at Wechasset. In this connection we are placed to learn that the Fine Arts Commission, fine submitted to Congress phase for the beautification of the Franama Canal, in which are unbodied landgeape effects designed to water scatter that the Fine Arts Commission, fine submitted to Congress phase for the beautification of the Panama Canal, in which we will be the submitted to Congress phase for the beautification of the Panama Canal, in which we will be a submitted to Congress phase for the beautification of the Panama Canal, in which we will be a submitted to Congress phase for the beautification of the Panama Canal, in which is the Panama Canal, in which is the Congress of the panama Canal, in which is the Congress of the panama Canal, in which is the Congress of the present designed to water the Congress of the present year. The first in the Congress of the present year, the congress of the present year. The first water water and the panama Canal and the Congress of the present year. The first water and an action of the panama Canal and the present year and panama canada and the present year and panama canada and the present year and panama canada and the present years and the present years and the panama canada and years and Tarabada dayan bargan ba Tarabada dayan barbada da

## Electricity

The Condenser Telephena.—The inventors Ort and Riegar are quite successful in their work on the concense telephones, having taken up the question in Germany with the idea of improving the results obtained by the method, and were able to preduce excellant telephone receiver, it is said. They first made leat telephone receivers, it is said. They first made use of a condenser made up of sheets of tissue paper treated with shellae and covered with throtil so as to torm a 0.05 microfarad condenser, and when used on the receiving and of a telephone line they found that it vibrated quite like a receiver and delivered articu-late speech under better conditions than herstofror. A still better makeup was of thin membranes of rubber stretched drumwise and covered with vary thin films of alterniquem as the sea 0.00012 inch, the thickness of or autemptum as in as a COUCH inch, the thickness of the rubber being about the same. Even greater success was now obtained, and the inventors state that the condanser vibrates as well as the common telephone receiver and even better, and gives clearer speech than has hitherto been obtained.

"Sillie."—A composition which the German inventor Dr. Egly calls "sillio" is said to be an excellent material for making up electric heating resistance pieces and the like. It is a compound of silicon and silicon carbide, and answers to all the requirements, for it is not injured by the heat and at the same time conducts the current, being also compact and substantial, and can be molded in any shaps. "Sillio" is not attacked by saids nor affected by expansion and contraction under best. The inventor tried cachorundum and silundum with most of the contraction The inventor tried carborundum and silundum with-out success, then he found the present method, which consists in mixing silicon carbide with silicon and a suitable binding material, heating the mixture and then giving it a final treatment in the electric furnace. then giving it a final treatment in the electric furnace. In this way he obtains any desired modeled shapes in a homogeneous and non-porous substance. As it is a conductor of current, it can be used to make up electric heaters of various shapes. Another use is for the obtained of the controllers, and the inventor finds that tubes up to three inches inside disanseer will come to a high heat when under current, so that they serve for wire-treating furnaces or for tempering steel springs, such tubes being very durable.

Portable Wireless of Tuning-fork Type. retuble wireless of luming-tora 1995.—Inc racine engineer H. Magunna, whose work with the late Prof. Mercadier in vibratory multiplex telegraphy is well known, now brings out a system of portable wireless known, now brings out a system of portable wireless outlite for military use in which he employs a new musical spark method. This consists in the use of tuning forks which break the 220-voit current at a constant rate of 750 vibrations, and a rather original method is used to keep up the vibration of the forks: for instead of using electro-magnets, which have some directions of the constant of t motor to drive an endless belt stretched between two pulleys so as to run continuously, and the sharp angle of one prong of the fork is presented to the belt surface so as to keep the fork in vibration by this purely me-chanical means. The fork, the transformer primary and the telegraph key are mounted on the circuit of a small dynamo, using a condenser to suppress the sperk, and the frequency of the current thus obtained is quite constant at the same rate as the fork and is independent constant at the same rate as the fork and is independent of the dynamo speed. He makes up very light portable wireless plants on the musical system, for aeroplanes and airchips, army field use, fishing boats and the like. One box contains the 1½ horse-power gasoline motor and small dynamo, and another the tuning fork ap-

Hydraulic Power Plants in Calabria, .-- Southern Italy is to secure a large amount of hydraulic power in the Calabria region for operating electric plants, and it is to sesure a large amount of hydraulic power in the Calabriar spoin for operating electric plants, and it is expected to lay out water storage reservoirs so as to obtain 50,000 horse-power. The fills mountain region has an abundant rainfall, but this is quite irregular during the year, for some streams which are torrents in winter are nearly dry in the summer season. In order to regulariste the flow there will be used four great reservoirs, the largest of which will contain 5,000 million cubic fest of water. At the start, there will be exceted a 50,000 horse-power turbine electric plant, and part of the oursent is to serve the interact of calcium tertilizer works, the resistanter to be sent over long power lines through Calabries and neighboring regions. Agriculture as well as liggions will profit by the new enterprise, as through the sum of the start, and the sent over land and the country will have a realonal trigation system, origing to the regular, water supply. Sardinia is to have a somewhat similar sobame before long, and at its inland is expensibly devoted to horse and stook eating, it is expected, that the quality of fodder will no longer eight during the largest plain. Numerous mines will impose the Calabrie plain. Numerous mines will impose the Samuel Sing prove Instead of expensive will impose the sense of the

## Aeronautics

The Wilbur Wright Fund .-- Horace Darwin, former Mayor of Cambridge, England, and a member of the Advisory Committee for Aeronautics, delivered a lecture on May 21st in aid of the fund to build a memorial to Wilbur Wright.

The "Record" Altitude for Captive Balloons was attained at the Lindenberg Observatory on February 20th, 1913, when three of these balloons were sent up to a height of 7,180 meters above sea-level (23,556 feet, or about 4½ miles). This is a little less than the "record" altitude for a kite (23,826 feet, at Mt. Weather, Va., May

A French Aeronautic School .- The school of aero-A Franch Aeronautic School.—The school of aero-nautics and mechanical construction which was founded at Pars a few years ago is now in very successful operation and is well attended. It is of an industrial character, and is intended to turn out eigineers for the mechanical industries in general, and more especially for the branches of aeronautics, automobile and allied industries. Entry to the school is determined by competitive examination, and to prepare for this there is instituted a prepara-tory course in a separate school. tory course in a separate school.

Natural Gas for Balloons.—We are informed by Prof. F. DeR. Furman of Stevens Institute that one of the graduates of Stevens recently made a little pleasure trip in a balloon inflated with natural gas. The pleasure trip in a dealoon innated with natural gas. The ascent took place at Akron, Ohio, and was the first ascent in a regular touring balloon ever made from that town. So successful was the trip that there is a chance of forming a small acro club in Akron to make regular ascensions at a cost probably not exceeding \$10 per passenger. The pilot of the balloon was R. H. Upson.

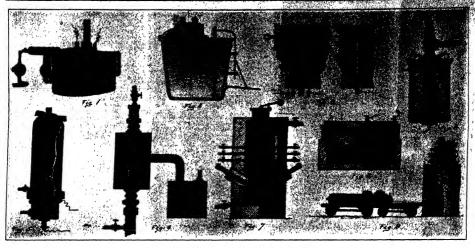
Making the Aeronautic Engine Non-gyroscopic,— William Phillip Holzmark of St. Louis, Mo., assignor of one half to Isaae Holzmark of vanne place, in patent No. 1,060,097, describes a non-gyroscopic engine in which two reversely running engines have a series of axially alined crank shaft sections with a reversing gear which permits one of said sections to rotate in one direction while the adjoining section rotates in a reverse direction and a single propeller is connected to one of the sections in such manner as to be driven simultaneously by both of the reversely running englues.

Dr. Beil and Transatiantic Flight .- Dr. Alexander Graham Bell recently announced that F. C. Baldwin, one of his assistants, seriously thinks of crossing the Atlantic in an aeroplane, in an effort to win the British \$50,000 prize. According to the newspapers, Dr. prize. According to the newspapers, Dr. oses that the flight be made at an altitude Bell prop Bell proposes that the flight be made at an altitude of five miles, where one thrut the density of normal atmosphere would permit a great speed. However the altitude record held by Legazueux, is only 17,878 feet, which means that Baldwin will have to go about 8,500 feet higher. There is trouble enough with motors, not to meution the luman breathing apparatus at a height of three miles

a height of three miles

A Parseval Dirigible for the British Navy.—A
Parseval arabilp constructed in Germany for the
British navy has been accepted by the Admiralty
Air Department. The vosed is the inneteenth constructed by the Parseval Company. The present
airship is designated as "P. L. 18," the first of the
series which came out in 1966 being regarded purely
as an experiment. The new British Parseval has
two Maylasch engines of 180 horse-power each, which
drive two four-bladed propellers. The newtope has
a capacity of 310,740 cubic feet, consequently the
coast is nearly 130,000 cube feet larger than the
existing army airship "Delta." The length of the
vessel is 275 feet and its greatest disaureter fortymiss feet. The fabric is treated with alumnium. At The fabric is treated with alummum. At feet. its first trial the airship is said to have developed a speed of 42.4 miles an hour. The lifting capacity is nearly three tons, exclusive of its own weight.

The Dynamic Meter is, according to international agreement, the unit hereafter to be employed in aerological tables and discussions in expressing altiservingness tables and dissussions in expressing sittude. The need of replacing geometrical by dynamic attitudes in dynamic meteorology depends upon the fact that the force of gravity is not the same in different latitudes. In studying atmospheric movedifferent latitudes. In studying atmospherie move-ments it is desirable that the system of coordinates adopted should include planes at every point of which the force of gravity is equal, so that the work required to transport a mass of air from one plane required to transport a mass of air from one plane to another against gravity is always the same. The dynamic meter is defined as a vertical distance cor-responding to 100,000 C. G. S. units of gravity potential and is equivalent, on an average, to 1.02 ordinary meters. The name of this unit, which is one of several new terms proposed by Prof. Bjerknes, has aroused much criticism.



Recent applications of the electric furnace in the industrial arts.

## Some Recent Improvements in the Use of the Electric Furnace

## Novel Uses for the Electric Current in Industry

EVER since the classic experiments of Day in 1801 of drawing an arc between two pieces of charcoal, and showing the chormous heat that can be produced by the electric current, the use of electricity for the production of high temperatures has been a very powerful weapon in the hands of the scientist means then known for generating current were of the crudest type, and it was not until the Slemens dynamwas pinced upon the market that there was any possi-bility of the commercial use of the electric furnace. Current generated by means of steam cugines us prime movers was still too expensive and was unobtainable In burge enough committies to warrant extensive use The greatest impetus was received by the installation of large water cower stations such as the Niagara Falls plant, where current is obtainable at greatly reduced cost, and in almost any quantity. Under these favorable conditions the electric furnace has become a most useful and important factor in a great number of indu This in turn has faraished favorable amortual tles for inventors, and the last year has seen a con-siderable number of improvements in electric furnice es, as well as in the structure of the various types of furmices

the great field of work has been in the from and steel industry. This subject is frentled historically. In a separate article in this being; but we present herewith interactions of two of the latest patients taken out in the I mited States. The first of these is the scheme in the voiced by Albert E. Greene of Chicago, Fig. I (instead States), 1184-1874, and 1184-1875, which consists in maintaining the roundy blown steel as it first course from the converter in a constant, predetermined temperature, and blowing through it is milking on cases that have the effect of coldibular out some of the impurities that it is desired to eliminate At the same time the modifier mass is subject to the action of a sing that flows of tow, which will dissolve out the other impurities on tow, which will dissolve out the other impurities.

A different process for obtaining partified Iron of a very nutform, unsity is due to William R. Walker of New York, Fig. 2 (1685,280). By this method the "microscopic sing" is more thoroughly removed and a better mixing of the constituents of the motien mass estatanced. The rough Iron is blown in a converter which has a "lastle" litting, and then is poured into a mixer, the litting of which is of a non-reld nature. Frum there it is poured into an electric furnace, the hing of which is of "nodi" nature. Here it is given the final partitiont and poured into a large mixing lade and from the mixing inde it is transferred to the journing or casting laddes. This is a continuous process and the products #85m several units are continuity exclanged, the result being a very uniform product.

phorus, and the slag on tup of the mass takes up the sulptur. The large mixing indic gives the finely divided slag u chance to separate out, as the Iron is still in a highly heated condition, which allows a longer and more thorough unification. The advantage of using the neid lining in the electric furnace is that the lining

lasts longer and is more easy to replace. Besides the steel industry the synthetic production nitrogen compounds, commonly known as "fixation" of nitrogen, is unother industry furnishing a great propect for the inventor. These pitragen compounds are need in making nitric acid, and further in making all kinds of fertilized compounds for agricultural pur-poses. The idea of combining the free nitrogen and poses. The mean of communing the free introgen and oxygen of the nimosphere has long been proposed, but the practical difficulties are munoanly great. Previously the chief difficulty appeared to be in obtaining a high enough temperature. The electric furnace has supplied this requisite; but another difficulty noneurs in the fact that the compounds at the temperature of formation are quite unstable and tend to break up just as fast as they are formed. If these gases can be couled immediately upon leaving the zone of formation, they may be preserved in a fairly stable state until they can be further combined. It is a difficult matter to cool the guess without at the same time cooling of the furnace, and thus wastlng a great deal of energy. The gases must be e to come uniformly in contact with the hottest part of the furnace, to obtain a uniform product. A number of inventors have attacked this problem with the view of putting out the arc and then striking it again, the interbut being used to cool off the gases. Heretofore this

Recently two French engineers, Bunet and Baden, Fig. 3 (nated No. 105,054), have devised a way of causing intermittent area, which is calmed to increase the efficiency of the apparatus to a marked desrree. As electrodes they use two conductors arranged like the terminals of the well known "ram's horn" elecult precisers for high voltage circuits. These electrodes may be merely two rods, or the one may take the force of a funnel with the other projecting up through; the center as a plain rod or plurality of rade. Air is blown up through the shortest part of the gap between the electrodes by means of a jet of rather high velocity. This of course tends to blow the arc up with it until the gap is so great that the arc can no league teap the gap and as a consequence it breaks. But the voltage of the circuit is great enough to cisse sisother arc to form at the lower end of the gap, where the distance is least. In fact, the investors claim that in

the top of the electrodes. From the top of the electrodes the combined gases are led directly into a spray of water or steam. The principle of the magnetic blow-out has also been used by the same inventors, to cause a rend succession of parts.

and to the different content of the commonly of the commonly. Another indexently method of fixation of nitrogen is the hierarchino of Joseph R. L. Brayden, Pig. 5 (patent No. 1.04)-211. A relevant part of the content of the content

But not only in these two great industries do we find the electric furnace useful, for a great number of miner industries owe their existence to, the electric furnace. For listance, the manufacture of, as for ligitime, heating, and industried purposes in accomplished by the dissociation of whom in the presence of carbon districts or a hydrogeneous and in pasts of purpose nearbon districts or a hydrogeneous and in pasts of purpose monophile is useful with pasts of purpose monophile is useful with pasts of purpose monophile is useful with pasts of purpose industries. The country of the hydrogeneous country of two hydrogeneous or country of the hydrogeneous or country or c

The second secon

men the displaced recommend of a color can a pro-cess ("Not coulded" description that he are an electronic content the soft-efficient of which he provided with a which such all yellocarbon and the channel and envisor discribed on a light-occurbon that the sideal space for explaced the significant of the channel and the those coulded with the country of the sideal space of the sideal space of the composition of the sideal space of the sideal space of the sideal of the sideal space of the sideal space of the sideal space of the sideal space of the sideal description of the sideal space of the sideal of the sideal space of the sideal space of the sideal space of the sideal space of the sideal of the sideal space of the sideal space of the sideal of the sideal space of the sidea

a possibilities looks largely to the electric furnace. The natural rocks that bear phosphorus are difficult to break up and the tremendous heat of the electric furthe tremendous heat of the electric fur-nace is one of the most powerful means of breaking up these stable compounds. Such a process is practised in the fur-nace as shown by F. S. Washburn, Fig. 7 (patent No. 1044867). Carbonaccous material such as coke or ceal screenings is charged in with the rock and the charge is heated by the passage of the current therethrough. Air in restricted amounts is admitted and the phosphorus is dis-placed from the rock by the carbon and passes off mostly as the pentoxid of phos phorus. The process is continuous, as the furnace is of the magazine type. The inventor claims that by the use of his apparatus be can obtain as much as 90 per cent of the combined phosphorus. The product thus obtained can be utilised in a great variety of ways, such as in the

Another industry that has been aided by the introduction of the electric furnace is the introduction of the electric furnace is the glass industry. The case of control-ling the exact temperature is a great factor in the success of the furnace. In a pro-cess carried out by Marius Sauvageon of Paris, Fig. 8 (patent No. 1,082,362), the itself forms the resistance material The furnace is started by pouring in some neited giass which, as is well known, is meited giass watch, as in well slightly conductive when in the moiten condition. The current passing through the moiten mass furnishes the necessary heat to melt the charge of sand and soda that is used as the raw material. The melted glass flows out from under a barrier which serves to restrain the raw material from becoming mixed with the finished glass. Such a furnace is very pleasant for the workmen to handle, as the best is localized at the central point of the furnace just where it is no and the glass is withdrawn from the outer or cooler part. There is no danger of the workmen getting a shock, as the voitage

production of fertilizer and matches

A very peculiar and ingenious use to which the electric furnace has been put is described by Howard R. Connel (patent No. 1,023,229), whereby jewels for meters and cheap timepieces are made and fin-ished in almost complete form at one operation. A carbon block with some hemi-spherical depressions is arranged to form e holder of some powdered tungs Upon heating the block in an electric furnace the taugsten is fused and forms upon its outer part a carbide of taugsten, which is an extremely hard substance. In each sion is formed a small boat-shap

head just right for a jewel.

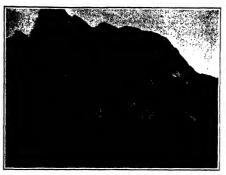
Another rather odd use to which the electric spark has been put is in a process for fumigation and killing of insects, Fig 90 (patent No. 1,037,744). Two tanks of gas, one of nitrogen and the other of scetylene, are arranged to discharge their contents in the proper amounts into a chamber which is traversed by a spark. Under the action of the spark the games unite to form hydrocyanic gas, which is very highly poisonous. When used to fumigate trees it is usual to inclose the tree in a tent and put the apparatus within the inclosed space. The control is effected by a switch some distance away.

Cutting Hair by Machine.—In patent No. 1,064,053, A. R. Coyle, Jr., of Traf-No. 1,004,053, A. R. Coyle, Jr., of Traf-ford, Peim, allows a half-cutting apparestus which is provided with outting blades op-erated by means of a vacuum and the vacuum slao serves to draw the haft to be out into the path of the blades or out-ters used delivers the out half to a suitable proposition.

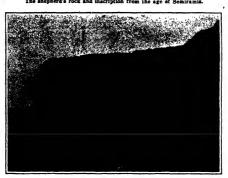
The Ballier of the Control

## e from the Land of Seniramis By Edgar J. Banks

SEMIRAMIS, the Oriental queen, who, until recently, S was supposed to have lived only in myth, has at last become a character in real history. Legend says she was the daughter of a fish godde miraculously fed by doves and reared by a si



The shepherd's rock and inscription from the age of Semiramis.



The Van castle wall, built in the time of Semiramis.



naine of a statue from the age of Semiramia

herd, that she was married to a governor of Ninevels, and won from him by King Ninus, that the king resigned to her his crown, that she built Babylon, and ruled Assyria for nearly half a century, that she was transformed into a dove, and was worshiped as a Becently, however, the German excavating to the old Assyrian capital city Assur has that one of the legends was true; she was really the wife of a king of Assyria.

Near one edge of the rains of Assur the Germans discovered a hundred or more tail stone monuments, monoliths from four eight feet high, standing side by side like gravestones in a cometery. Most of them were inscribed near the top with a few lines of ancient Assyrian cunciform writing. They were monuments erected in or of the kings and nobles of Assyria, and one of them bore the inscription of Semiramis, which, with one exception, is the only mention of a woman of high rank upon the monuments of Assyrin The in-scription reads: "The column of Sammuramat, the wife of the palace of Samsdadad, king of the world, king of Assyria, the mother of Adad-nirari, king of the world, king of Assyrin, . . ? of Shal-manusharid, king of the four regions."

ammuramat and Semiramis were one. Instead of twenty-two centuries B C . she lived about 750 B. C., and the fact that a monument was erected to her may indicate that she was really a queen, and one of the greatest of rulers

Her name to-day is still a common word in the more remote portious of the Turkish Empire, throughout all the region from old Armeniau capital, to ruins of Ninevell. Shamirum, as she is now called, must ut one time have been the ruler of all that country, for it is also filled with monuments associated with her name. Local tradition says that she was the queen of Van before she became wife of the king of Assyria. the Shamiram aqueduct which still brings water to the Armenian city. Upon the summit of a high hill near Van are the ruins of a rock-hewn fortress and of a temple attributed to her Scores of cuneiform inscriptions in the vicinity come om her time. In the very center of the city is a high rock surrounded by massive stone walls. Cut into its sides are long inscriptions and rock-hewn for resses and lace in which she is said to have lived Upon the summit are the ruins of a fortification. Recently, the Turkish soldiers, who are stationed on the summit of the rock, discovered among the ruins the er part of a large black stone statue Too heavy for them to carry away, or ignorant of its value, they left it there among the rubbish, where I found it. It is headless; the body is broken into tw parts: the feet, or the pedestal into which they were imbedded, have disappeared; the arms, bent at the elbows, are built into the body; in the lands are two imple-ments, probably the symbols of office, the as is a long tunic open in front with fringe along its edges. Though the head is missing, the hair was long; traces of it

still appear on the shoulders.

The date of the statue is certainly the same as of the rnins in which it was found, and of the inscriptions upon the rocks, or about 750 B C it comes from rocks, or about 750 B C It comes from the time and people of Semiramis, and though probably not of that queen, it is the only known Vannic statue, and as such, is of unusual historical interest. Research in this almost unknown land of ramis promises to restore the lost history, art and literature of the empire of this once supposed mythical queen.

## Fire Waste at the Conservation Congress

FIRE waste in the cities of the United States as allied to forest and water conservation will be given a prominent piace in the deliberations of the Fifth National Conservation Congress to be held in Washington in November Facts and figures emphasizing the tremendous loss caused by unnecessary fires will be laid before the congress by speakers of national note and means will be consider for the reduction of this vast waste.

## Fighting in the Air

By Carl Dienstback
THE German press was recently permitted to publish the results of tests in which many hundred rounds of ammunition were fired from a machine gun mounted on top of a Zeppelin airship in flight. As could be on top of a Zeppenn airsmp in night. As cound be foreseen from the absolutely stable nature of that gan platform and from the entire lack of vibration and swoying, these tests were almost as successful as they would have been had the gan been discharged at the

would make been and the kim been discensived at the dop of a mountain. The whiter speaks from experi-cace, having made tests in siming from the window of the cablin of the "Victoria Luise" in full light. These maching un trials were conducted to test an arbithy's shilly to defend listed against uncoplanes. The provious and the number of Fronch accoplanes made some such demonstration imperative during the political stress of the Baikun situation. The French seem to have attached little importance to the armament of the Zeppelius in view of the ever-increasing climbing powers of aeroplanes.

ropianes have recently reached altitudes, even with engers, that are still prohibitive to airships, except at the sacrifice of much gas and carrying capacity. dirigible's faster climbing is offset, it is argued, by the neroplane's ability to operate against the airship at a high level from the outset. Nothing prevents an aero-plane from doing much of its climbing at the start. Such was the lesson taught by the aviators who cross the Pyrenees and the Alps.

France aerial fighting is considered a climbing contest, a duel between two artificial birds of prey. As the aeroplane is sure to get on top of the le eventually, the latter's fate seems scaled in French eyes. It is, however, interesting to probe the question more deeply. Altitude appears a deciding factor because it is assumed that an aeroplane can, by superlor apeed, easily get in position to hover "motioniess trees tively) right above the airship and applicate it by merely dropping a bomb. The fallacy of this French reasoning rests on the comparative velocity of a ma chine gun's hullet and a dropping bomb's. In view of the airship's armament and the necessity for the aero-piane's flying with the same speed and in the same direction as the dirigible, in order to hit the quickly moving object, it is considered necessary that the bomb should be dropped from an elevation of no less than 2,000 feet above the airship. The calculations which permit an aeroplane while fiving across the ground to hit a target with a bomb by properly considering measuring its own speed relatively to the target and its distance from the ground, are no help ln aiming at an airship. Only the aeroplane's own velocity need be considered in fighting an enemy on the ground, but the relative speed between an airship with a motion of its own and an aeroplane (and also the vertical dis-tance) is such an indefinite quantity that no reasonable calculation can be based upon it. Nothing remained but to make use of the aeroplane's superior speed in obstinately hovering straight over the dirigible and "thus so far improving the aim that hitting became reasonably certain even at a vertical distance of 2,000

It remains to be seen how this theory works out in practice. The accuracy of the modern machine gun is such that in the opinion of military experts it does not anticiently scatter its bullets; it absolutely depends on having the correct range. In this respect a company of infantry is better than a Maxim. But precious ammunition must never be wasted in the air by scatter-ing the bullets, and "correct" range is "guaranteed," if the enemy can be hit point blank from a safe dis-

The invention of the steelclad "S bullet." pointed as sharply as an arrowhead, seems almost designed for aerial use. Indeed, it barely antedated the airwhip. It doubled the point-blank range which had already been pushed to 820 feet with the former blunt bullets At very high angles the point-blank range is again doubled. Therefore, an aeroplane is in peril at any point of an extensive zone around, and especially abo an armed Zeppelin. The latter's wonderful steading as a gun platform and the ever-increasing independence from range finding, uncertain in the air the higher the angle of fire, and the perfect accuracy of the mod-ern machine rifle are formidable factors that must be reckoned with. It goes without saying, that the gun on top of a Zeppelin will be intrusted to the crack shot of a regiment.

To use dropping bombs against such a weapon seems like a return to the medieval practice of pouring pails of boiling pitch. At a vertical range of two thousand feet, the distance of about seven streets, it would not require exceptional skill to hit an aeroplane, in its broadest aspect, which has to first an aeropanae, in its broaders was easier, which has to remain more or less stationary with reference to the dirigible if it is to use its bomb effectively. A bomb requires thirteen seconds to drop 2,000 feet. Thirteen seconds is time enough to evade an unwelcome visitor

In the clear air of the upper regions, a good pair of binoculars will enable a look-out on the steady dirigible to study in detail an aeroplane, "stationary" at 2,000 feet. The release of the bumb could no doubt be plainly seen (even in twilight with the help of the p archight now mounted on all big dirigibles) and an searchight now mounted on all big dirighoses) and an instantaneous electric signal to the helmstan will com-ple the strabily to turn. Running sixty-nine feet a so-cond, and, on account of the immense surface of the bull in proportion to the total weight, very quick to beep its rudder, it will be far from the point aimed at when the bomb at last arrivas. But the airship will hardly make it so easy for the aeroplane to remain vertically above it. It will surely turn and circle all the time the aeroplane is trying to get at it. This will not interfere with its own fire (a bullet travels 2,436 feet a second in a practically straight line at very high angles, only an insignificant adjustment of the sights to the known relative wind being required) but will hopelessly disconcert the aim of the man who is directing the aeroplane's bombs. For this there are several reasons. The eye alone can hardly determine several reasons. The eye alone can hardly determine whether the aeroplane is fifty feet out of a vertical line of 2,000. The suspended telescope used by Lleut. Sect for more exactly aiming bombs begins to oscillate and falls utterly in signag flight. A bomb released during a turn files wild, because centrifugal force does not allow it to drop vertically, and there is no way to ascertain the exact horizontal component of its traject-A bomb released between turns (if the airship should ever give such a chance to the aeroplane, which to stay right above it has to "copy" its every twist) is deflected because, after retardation by the turn, the airship's (and the aeropiane's) speed is not uniform, but accelerating. This, with the bomb's added retardation by the "relative" wind, is liable to drop the best almed bomb behind the airship. Finally, without an automatically vertical telescope, unaffected by irregular flight, and also the highest skill in steering, it is impossible to remain straight above the constantly

is impossible to remain straight above the constantly turning dirights. The task is further complicated by the need of maintaining stability in the wind, to which need the dirightle is not subjected.

The fact that light aeroplane bombs of small mass and large surface are always defected in passing through different wind strata, applies to all bomb work on aeroplanes. There is but one remedythe aeroplane's car, and getting nearer, even though it means destruction by the airship's explosion. But with means destruction by the airship's explosion. But with a machine gun it is possible to fell a tree. The wings, which cannot be armored, are vulnerable spots. Armor, moreover, will surely compet the use of small cannon in place of machine rifles. The use of small cannon will also be the eventual result of the attempts to arm aeroplanes with machine rifles. Fighting it out with firearms on both sides will be the natural end of the laced hawk-like tactics.

But if the airship mounts weapons which an aero-lane can also carry, it will, with its huge hulk, be at a disadvantage against a fleet of smaller aeroplanes. Naturally it must make good use of its capacity for mounting heavier pieces with longer range, and keep the aeroplanes at a safe distance. Then they will be shattered before their own weapons get into efficient range, because the heaviest cannon an airship can mount are almost as quick and handy as a rifle We can depend upon seeing cannon appear on the large dirigibles in strict accordance with the stage of deve ment of their adversaries, just as we saw machine gues appear, which are ample protection while aero-planes have no worse intention than flying over the airship and dropping bombs. Lowis Oliver, who flow over besleged Adrianople, anys: "It is no easy thing to regulate one's aim with bombs—I have tried it."

## What Are the Ten Greatest Inventions of Our Time, and Why?

## A Prize Article Contest Open to All Scientific American Renders

THE November Magazine Number of the Scientific American is to be devoted in part to a review of the A ALEMAN is to be devoted in part to a review of the great inventions of our time. Because a large number of Scientific Aleman readers are either inventors or users of inventions, it seems to the Editors that their judiment of the inventions produced in our time which deserve to be called the greatest, that appraisal of the relative importance of the paramount technical calcievements of our day, would be of peculiar values and interest. Therefore, it has been decided to leave the active mixture to them. the entire subject to them.

the entire subject to them.

The publishers of the Schenzupe American seffer three prizes of \$150, \$100 and \$50, respectively, for the three best articles on the topic. "What Are the Ten Greatest Inventions of Our Time, and Why?"

Contestants for the prize must observe the following

Each article must discuss and answer the fells

ing three questions:

a. What, in your estimation, are the ten greatest

The first of

inventions produced within the last twenty five years?

b. What are your reasons for this selection? Subtity your selection in each case.

TO STATE OF THE ST

c. To what person or persons is the greatest of due in the developing and perfecting of each inve which you have selected?

2. The entire subject must be covered in a type-written article not exceeding 2,000 words in length, and must be treated as simply, lucidly and non-techneally as possible.

3. In deciding what are the ten greatest invention of our time, the contestants are limited to machine devices and discoveries commercially introduced in the

last twenty-five years.

4. Since the SCIENTIFIC AMERICAN is "the weekly journal of practical information," and its readers practical business men and inventors, the articles submitted ld deal only with potentable inventions and dis-

5. In order to guide the contestant in deciding what is a great ploneer invention of our time, it is suggested that practical success and general usefulness to man-kind be used as a test. A modern discovery may have been suggested long ago and its underlying theory even worked out mathematically, as in the case of wireless telegraphy, but nevertheless it falls within "our time." telegraphy, but neverbletes it falls within "our time," if it has been made generally accessible and useful within the last twenty-five years. But commercial success should not be the sole criterion. The firing machine has not yet added millions to the machine has not yet added millions to the machine which but for all that, it is a great invention of our time. More improvements on well-known and successful devices are not to be numbered among the great invention of our time. Because an invention was first patented more than twenty-five years ago it is not necessarily debarred. The date of commercial far introduction not the date of the patent governs. The troduction not the date of the patent governs. The oreover, need not have been actually patented, but its subject matter must be of a patentable nature. Patentability is merely a test of commercial practicability.

stants must not disclose their identity. Each Conte 6. Contestants must not disclose their identity. Each article must be signed with an assumed name and must be accompanied with a sealed envelope, on which the assumed name is written, and in which the real name and address of the author is contained.

Contestants must address their articles, accompanied by the envelopes containing their real names, to "The Invention Contest Editor of the Scientific American, 361 Broadway, New York City."

8. The articles will be passed upon by a Board of Judges, whose names will be announced in a future issue of the Scientific American.

9. The Board of Judges will receive only the arti-

W. The Board of Judges will receive only the arti-cles submitted; the envelopes containing the true names and addresses of the authors will remain in the pos-essation of the Editors of the Schryttze Augusta. When the fudges have made their decision, the Editors will open the envelopes of the winning contestants and notify them of their success.

The decision of the judges will be announced in 10. The decision of the judges will be announced in the Schartific American of November 1st, 1913. The prise-winning articles will be published in the order of merit in consecutive issues of the Schertific American, beginning with the issue of November 1st, 1913.

The Editors of the Scientific American reserve 11. the right to publish in the SCIENTIFIC AMERICAN or the SCIENTIFIC AMERICAN SUPPLEMENT articles which have not been awarded prizes, but which are deemed worth; of hor le mention.

12. While contestants are not required to supply fetures with their articles, illustrations will be welcomed. If drawings are submitted, they need not be elaborate; the staff artists of the SCIENTIFIC AMERICAN will work them up for reproduction, provided the mais-rial supplied is intelligible. Do not send pictures torn from books and periodicals; they cannot always be reproduced authanctority, and their unauthorized re-production may constitute a copyright infringement. production may constitute a copyright maringement.
If photographs marked "copyright" are sent, they
should be accompanied with the copyright owner's written permission for their reproduction.

13. Members of the staff of Munn & Company, In-

rporated, publishers of the SCIENTIFIC AMERICAN, and of Munn & Company, solicitors of patents, are excluded from the contest.

All articles will be received up to 5 P. M., Sep tember 1st. 1918.

The Problem of Fuel in France.—The French Automobile Club lately decided to appoint a technical commission for the purpose of looking into the matter of finding a new liquid fuel for internal-combustion motors and also a sew figuid fuel for internal-combustion motors and also of increasing site economy of running engines with the present fuels. The commission is headed by the Princes of Arasistery and contains well-known technicians used. De Skyri, Chasseloup-Laubas, Fameschon and others. One of the questions which is being agitated of late in to provide is combustible of home predictions on as to be independent of other constraint, especially in one of war.

## Corrennembence

(The aditors are not responsible for states made in the correspondence column. Anonymous munications cannot be considered, but the nem correspondents will be withheld when so desired.)

## Price Projection

To the Editor of the SCIENTIFIC AMBRICAN:
This company believes in the principle of retail
price maintenance because this is the best way to price maintenance decause time is the creat way to assure sheelute fairness to consumer, retailer and manufacturer. Such maintenance does not mean mon-opoly and expertence proves that well asstained prices on well-known and dependable products means lower

and fairer cost to the user on general products.

Unfortunately trade conditions have not permitted us to put this principle into practice in our own lines; but this does not change our desire to ac-

complish it whenever possible.

THE LOWN BROTHERS COMPANY,
Dayton, Ohio.

C. H. LOWE, Vice-Presider

## Price Cutting and Its Bad Effect

To the Editor of the SCIENTIFIC AMERICAN: To the Bidtior of the Scinswiss characters:
A desire having the exclusive squency for an advertised line of goods (unpatented) usually undertakes and of necessity does earry a suitable stook of such goods; and ase the manufacturer does not sell the same goods to sayons elses in the same etity, and does not himself sell goods direct to consumers at out prices, the dealer is thus assured of his leptifuncte outprices, the dealer is thus assured of his leptifuncte of the same control o

If, however, the manufacturer is compelled to sell other dealers in the same city, or is forbidden by law to fix the price at which the goods are to be sold, the dealer no longer has an incentive to carry a stock of goods, and in a short time it comes shout that no

the dealer no longer has an incentive to carry a stock of goods, and in a short time it comes about that no one in that city will carry a stock of goods because there is no profit in handling then.

The invariable desire of the masufacturer is to make the selling price to the public, especially of unpatented goods, as low as possible, fixing the profit of the dealer as small as the dealer can be satisfied with, in order that his goods may move freely: and the effect of an excritant price is always disastrous to both the manufacturer and dealer, because it tends to diminish the sale of the goods.

GLOBE-WENKINGE COMPANY

GLOBE-WERNICHE COMPANY Cincinnati, Ohio. H. C. GRISHR, Presid

## Compulsory Licenses Under United States Patents

To the Editor of the SCIENTIFIC AMERICAN: One of the provisions of the Oldfield patent bill One of the provisions of the Oldfield pakent bill that is now before Congress is for the compulsory granting of licenses under patents that are not being adequately worked. In this connection, it is inter-esting to recall that England has had a similar pro-vision in operation since 1838. Under an act of that date, any person who could show that a patent was not being adequately worked in England, or that the not being adequately worked in England, or that the reasonable requirements of the public with repect to the invention covered by the patent were not being supplied, could compel the patent were not suit, to grant him a license to manufacture under the patent. From 1883 to 1997 only three suits were filled asking for such licenses, and once of these over proceeded to a hearing. Since 1897 a few suits have een brought, but generally speaking, there seem be a disinclination to invoke the privileges of law, due in some measure, no doubt, to the fact that a formal application for a license in such case would apparently carry with it an admission on the part of the applicant that the patent is valid and that the device he wishes to make is an infringement, and manu most cases, it is preferable to endeavor to evade the terms of the patent and let the patentee be the complainant in a suit, thereby placing the burden of the litigation on the patentee, and placing the manufacturer in a better position to negotiate a license by com-

A later act (1907) amplified the earlier law some A later act (1997) suspansed see outlined that the reasonable requirements of the public should be deemed not to be satisfied if any trade or industry is unfairly projudiced by the patenties trade or industry is unfairly projudiced by the patents on manufacturing the patented device to an adequate extent or supplying it or granting Bosses to manufacture it on reasonable terms, or by condition attached by the patentes to the purchase, restail, or use of the patented device. Still, in 1908 there was only one petition filed under this law, and that was withdrawn by agreement between the parties. The binds principles of patent jurispectations being the sense in this country as in England, it is reasonable to suppose that a law tills the above would be of 200 more use hope than is him growen to be in

Great Britain. A law that has been practically a dead letter in England since it was put on the statute hooks in 1883 is certainly of no value on the statute books of the United States.

THE PACKED MOTOR CAR COMPAN.

MILTON TABLESS.

MILTON TIBBETTS, Patent Counsel.

## Fixed Prices Protect the Consumer

To the Editor of the SCIENTIFIC AMERICAN: To the Editor of the SCIENTIFIC AMERICAN:
The manufacturer must say at what price the retaller shall sell his product, and the law must compel
the retailer to do this to prodect the consumer.
How? Because stores out prices on certain advertised

Hov? Because stores cut prices on certain advertised article to attract trade on other articles, scarding a sarticle to the profit on an advertised article to make it up on a raticle that yield an abnormal profit, i. e., a profit that will cover the loss on the advertised article cut. Therefore the consumer has been misled and deceived. The manufacturer's business has been injured, for other retailers who decire to sell his goods at a living profit will not handle an article which they cannot sell at full profit. full profit.

ould two manufacturers of a similar article get Should two manufacturers of a similar article get together and agree to sell their goods at the same figure, that would be an act in restraint of trade. But when one manufacturer seeks to fix his own price, other manu-facturers of the same thing may fix their prices a little if they wish to.

YAWMAN & ERBE MANUFACTURING COMPANY. PHILIP H. YAWMAN, Presid

## The Danger of a Distributing Trust

To the Editor of the SCIENTIFIC AMERICAN: To the Editor of the Solishtype Alexicas: We believe that present American ignition and court decisions on price maintenance are made under a misapprehension of facts, and that the purposes which it is intended to accompilab by such activities will not be covered, but quite the reverse. All legislation along such lines has been advocated upon the ground that it would prevent monopoles and trust from having that it would prevent monopolies and trusts from having undue profits. As a matter of fact, these great organiza-tions will escape, because practically all of the great trusts have their own distribution. It will be the smaller concerns and those doing an honest and legit-mate business, attempting to do nothing except protect their customers from unfair competition and to main-tain the qualify and standard of their products, who will suffer. It will be impossible for any person having nown brand and reputation for quality to maintai a known brand and reputation for quality to maintain its quality if he is not allowed to protect the price at which such merchandise is resold. It will be used as a "football" and "extchpenny" by the great depart-ment stores and mail order houses, who ask nothing better than the opportunity to sell something of known standard for a less price than it can be sold at by any-body else, no matter whether they make a profit on it or not, in order to attract customers for less worthy

re is fast arising in the United Sta which it will be much more important for the Gov-ernment to control than the producing trusts. The most oppressive of all trusts would be a distributing most oppressive of all trusts would be a distributing trust, which would have control of and tyrannize over all small producers. This is a condition which is not a figment of the imagination, but it does to a certain degree already exist, and the smaller tradesmen, who perform a great service for the community, and who make their living chiefly from standard merchandise of known merit and of standard price, are to-day in anown ment and of mandard price, are to-day in ager of being run out of business by price cutting great department stores and mail order houses doing of great department stores and mail order houses doing a out-threat business. There are to-day in the United States fire dry goods retailers who each distribute over \$25,500,000 worth of merchandles a year, not to mention mail order houses that do a business cover-ing overything from barbed wire to a handkershief. The real menace of the United States to-day is price

titing, not price maintenance. Chever Brothers, South Manchester, Coun. By Horace B. Chever.

## Price Fixing and Competition

To the Editor of the Suneriro Augustain.

To the Editor of the Suneriro Augustain.

We are deeply interested in the question of maintaining uniform reisel prices on advertised articles, when the manufacturer thereof is subject to full and free competition. We believe this would be to the best interest of the public, the retail desier, and the manufacturer. Our position agrees with that taken by Mr. L. S. Benades in an address delivered in New York May 14th at a dinner given by the Association of National Advertising Managers.

It is summarized in the May magnetin issue of the Outlook.

Unition.

To illustrate: We have manufactured for half a contury or more an instituteneous chocolate of unusual merit. This is sold to retail grocers at 62½ cents a pound, and the advertised retail price is 75 cents a ound, showing for the retailer a profit on his selling a

price of about 17 per cent. The majority of dealers do not sell this article, chiefly because the leading grocers for many years have sold it at "out prices" ranging from 65 cents to 70 cents a pound. The stores that out the advertised retail price are willing to sell that out the advortised retail price are willing to sell instantaneous checolate at a price that nets them a loss, when their cost of doing business is considered, making of course more than the average profit on articles that are not advertised and on which there is no standard price. The results of this condition are to prevent the wide distribution of this specialty, as the average dealer does not care to carry in stock an article that allows him less than a hving profit, making it unprofitable for us to advertise it. This price cutting finally results in a failure to serve the large numbers of people who would be glad to purchase the chocolate at the fair competitive price of 75 cents a pound at the nearest grocery store. Please bear in mind that this price is fair, based upon the cost of producing the article, and is in direct and full competition with every other chocolate on the market—It happens to be the highest priced of all, but there is absolutely no reason for anyone paying the price except the unusual quality of the product. We believe th

of the product.

We believe that when we sell this article by means
of our own publicity campaign we should have the
legal right to fix the retail price, and that the law should
protect us, and the public and the average dealer against
the price outter.

t we expressly do not believe that any retail price should be protected that is not regulated by full and free competition. That is, we do not believe that manufacturers or trusts should be permitted to fix high prices by eliminating competition, nor should they be permitted by temporarily cutting prices to destroy the business of smaller competitors, their usual method of securing a monopoly.

STEPHEN F. WHITMAN & SON, INC.

Philadelphia, Pa. J. W. WHEELOCK, Adv. Mgr.

## The Birth-months of Genius

To the Editor of the SCIENTIFIC AMERICAN:

The influence of season upon the human embryo, in so far as concerns the mental and moral traits of the after-born individual, appears to have received scant attention at the hands of science. Its influence upon the physical organism seems not to have challenged the physical organism seems not to have challenged over-much investigation. As a possible factor in sex-determination the subject has been considered, and the conclusion reached by Dusing and others that more males are born in the human family during the cold months of the year. That temperature, however, and seasonal changes may have many indirect and as yet unsuspected bearings upon embryonic life appears to be recognized by scientific writers. As affording a basis for a future study of the influence of season, during the sensitive stages of the pre-natal

As anorems a coast for a truther study of the intrense of season, during the sensitive stages of the pre-natal life, not only upon the physical but upon the mental and moral being of the individual in after life, the present writer has tabulated the birth-months of the world's thousand most famous men and women, using for the purpose the list of names published by Prof. J. McKeen Cattell in the Popular Science Monthly for Pebruary, 1903. Of the thousand names, the information desired was afforded as to 431 by the authorities soun cesures was amorded as to 431 by the authorities at the writer's command, and of these 45 were born in January, 40 in February, 34 in March, 36 in April, 38 in May, 20 in Jule, 29 in July, 34 in August, 36 in September, 36 in October, 41 in November, and 36 in December

A tabulation by vocations of the names in our lists yields some curious results. Of the eminent perso connected with the church, for example, we find find that 27 were born in the latter half as against 8 in the half of the year, and much the same is true of poets, with whom the ratio is 25 to 15, and scientists, with whom the proportion is 30 to 24. On the other hand, 25 philosophers saw the light in the earlier half as against 15 in the latter half of the year, and in the case of states-men the numbers are 25 to 20, in the case of military oters 22 to 13, in the case of musical composers 8 to 4, painters and sculptors 8 to 6, and in the case of writers, including historians but not including those classed in the biographical dictionaries as philo ophers, 26 to 25

unlikely, these figures are morely accid and without special significance. It is noteworthy, however, that the calendar of birth-months for men of genius, formulated thus from the writer's data, of genius, formulated thus from the writer's data, appears to answer closely to that for the ordinary population, for, according to Mulhall's "Dectonary population, for, according to Mulhall's "Dectonary population, for Europe are: January 107, February 107, March 107, April 103, May 99, June 94, July 93, August 95, September 101, October 99, November 97, December 98. Allies in our table and that of Mulhall, be it remarked, a sheelded diminution in number of birth appears for June and July, and in both the earlier months of the year show a larger average than the closing months.

Fort Worth, Texas.

Challes Kassel.

AND SARE A. . CO. 162 May

## The Electric Production of Steel

## From the Early Experiments of Siemens to the Thirty-ton Furnace of To-day

IT is of course impossible, within the limits of the present article, to attempt an elaborate and detailed survey of the progress of the art of applying electric energy in the production of from and steel. Our purpose is rather to give a lirel frisand, commencing with the classic work of Steneus in the late seventice, and touching upon the more important steps by which the art has been brought up to its present degree of enforcement.

The importance of this latest development in the metallury of from and steel is little understood by the general public, who may be surprised to learn that the scleric furnace has been brought to a state of such efficiency that it is now possible to turn out a steel equal in quality to the costly eracible steel, how any another to many of the leavy tracks which hitherto have been restricted to the use of Bessener and open-harrin steel. The readers of the Surstruck American will apprehent the spirituance of the above fact, when we stare that steel raths are being made in commercial quantities from the high-grade steel which it is now possible to produce in the electric furnace, and that these raths, because of their purity, hardness and ductility, have shown in active service that they are well able to stand up under the heavier wheel loads and higher speeds of modern railway traffic, even under the severest conditions of whiter temporature.

Mainly because the steel rail enters so largely into the question of safe railroad travel, we have mentioned this nuterial as one of the heavier products that will benefit by the excellent qualities obtainable by electric rediaing. It must not be supposed, however, that the field of application of electric refining is limited to this, or to a few specialities. We have before us the statistics of the Heroint electric furnaces now un operation and building, and the kind of materials they produce; and from this we find that, among other products, they are turning out steel for the construction of war material such as guns, protective shields, projectives, etc., and for locomotive tires and axies, seamless tubes, dynamo sheets, wire and wire rods, tool steel, little grade castings, and other products calling for steel of high quality.

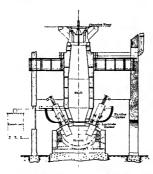
Until the appearance of the electric furnace, the process of making the luik of the commercial steel for ralis, beams, griders, plates, rods, etc., consisted in the sancting of the fron ore in the blast furnace, by charging the furnace with iron ore, coke and lime-stme, and reducing the ore by the facre combustion of the charge under the action of a powerful not blast. The multen tron was then rid of its inspurities either in the Beesemer converter or in the open-hearth furnace, in the course of which treatment the steel was brought up to the proper composition by the further elimination of current and the regulation of the desired amount of curbon and other destrable constituents. Great as were the improvements effected by the litroduction of the Bessemer converter and the open-hearth furnace, both as to the quantity and quality of the product, the further purification of the steel and the securing of the high-class material of the cruchble process, without an

undue increase in the cost, has been the goal at which the steel makers have aimed for many a decade past. It is largely because the electric process remders if possible to make steel in large quantities possessing the high qualifies of crucible steel, that electric rething has proved such a valuable contribution to the metatings of steel.

SIR WILLIAM SIEMENS,-For the gen esis of the electric retining furnace, we must go back some three decades and speak of the classic experiments of that who foresaw the great possibilities of the electric furnace for steel manufac-He built two furnaces, one of which was a crucible of graphite some other refractory material, which was inclosed in an insulating jacket. One electrode was held in the bottom of the crucible and another passed through the cover and was provided with a d vice for maintaining it at the proper distance from the lower electrode. metal was placed in the furuace and covthe lower electrode, and the arc was formed between this charge and the upper electrode, in his other furnace the two electrodes were placed horizon-tally and opposite one another, the arc

melting the charge beneath it by radiation. As we shall see inter, these two furmaces anticipated two of the modern, well-known, electric sieel furnaces. Like many a famous inventor, Stemens was ahead of the state of the art; it is the modern development of electrical engineering that has made it possible to upply bls system

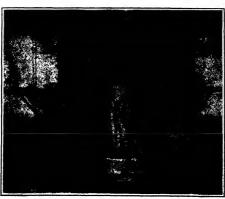
o the reduction of steel to commercial quantities
THE ELECTRIC SMELTING FURNACE—When the devel-



Latest type of Swedish electric smelting furnace.



Section through Stassano furnace.



Stassano electric arc furnace at Turin, Italy.

opment of electrical audinesting had advanced to the point which warrant, on secured to warrant, its application to steel making on a commercial scale, it was inevitable that the entry efforts would be directed the substitution of electrical energy for the fuel and hot bination fine smelting furnance; and the efforts of entry of the smelting furnance; and the efforts of entry of a microscapil electric smelter. Of this type was the interaction of a microscapil electric smelter. Of this type was the interaction of the shown in the stansaction prompting illustrations. This is a rotating furnance, which consists of a cylindrical steel casing, fund internally with first-trick, and rotates shout an intellined axis upon a set of rollers. The charge consists of ron or pulverised and made up, with charcosi and other necessary elements for reduction, into briquettes. The current is passed through the lower channel by contact rings, and projecting into the turnace are everal electricodes whose position is regulated by menus of cylinders, one of which is shown in section. As the gasses are formed, they are led off through the invalidation of this kind which is now at work in the sovernment shops at Turin, for the melting of steel series.

That there will be my world-wide substitution of the electric reduction furnace for the present blast few, mace is unlikely. The change can be made profitably only in those localities where coal is dear and the production of electric energy is cheap. As matters now stand, if the electricity has to be generated through the medium of coal-fired hollers, stems engines and dynanos, the electric smaller cannot possibly compete with the blast framce: but it has been proved, notably in Sveden and also in California, where foel is relatively dear mid the supply of electricity generated in hydroelectric works is abundant and cheap, that excellent high from may be produced successfully on a commercial

The Noble Electric Sieel Company of California, where charcoul is obtained at low cost, are using successfully an oblong furnace with four electrodes projecting downwardly from the roof of the furnace. The Swedish reducing furnace follows in construction the general lines of the blast furnace, the charge being introduced at the top and the hot metal being tapped off at the bottom. The place of the heart in of the blast furnace is taken by a domed receptacle built at the bottom of the furnace, through the roof of which from two to six electrodes project diagonally into the furnace. That the Swedish works are producing pig iron on a commercial scale is shown by the fact that last year the total unique was might some commercial scale in shown by the fact that last year the total unique was a long to the same commercial scale in the same commercial scale in shown by the fact that last year the total unique was a long to the same commercial scale in the same comme

year the total output was about 20,000 tons. ELECTRIC REPRIME PURMENS.—The field of electricity in the manufacture of steel will be confused mainly, for the present at least, to the refulluy of steel. For this work the various furnaces may be divided under three types: First, tinese in which the heat is produced by the relestance of the metal in the bath, a type which has never passed the experimental stage; second, those in which the heat is due to electric curront induced in the bath; and, thirdly, those in which the metal is heated by an electric are cylicher by direct contact of

the arc with the metal or by radiation from a super-imposed arc). Of the three types, the electric-arc furnace is the most successful, and it is in such extensive use us to warrant the belief that an tiensi for the refining of steel it may ultimately have exclusive command of the field. The induction furnace, which was formerly a promising rival, has done good work and is still in use in some of the more important works, particularly in Germany. The resistance furnace has gone very little beyond the experimental stage in the refining of steep fining and the still in the stage of the stage of the refining of steep stage in the refining of steep stage.

The Gin Hesistrance Funnace.—The Gin furnace, as shown in our illustration, consists of a car, upon which is constrarted in furnace of masonry, provided with a iong serpentine channel 4, connected with electric pole pieces at B. This channel is filled with the metal to be treated through hoppers H. The desired temperature for treatment is obtained by varying the current passing into the hot metal in the beth.

THE KJELIN INDUCTION FURNACE.—
The induction furnace, of which the Kjellin, shown in the accompanying illustration, is a well known example, is practically a large crucible free from electrodes in which the steel is heated by



The Gin resistance furnace, an early experimental type.



Sections through Gin furnace.



Kiellin induction furnace.

an induced current. The charge is protected from the action of any farnace gases and from oxidation. This farnace consists of an annular hearth A formed in the masonry body of the furnace; an fron core C, one arm of which passes through a central hole formed within the annular hearth, this arm being surrounded by a primary coil D. The charge in the annular hearth A is maintained at the desired temperature by varying the current through the primary coil D. The torace is closed by removable cover plates, not

shown in our drawing.

The Richtaine-Romentaines Industrian Firmace.

The Right furnace above described is necessarily of limited capacity, and both its diameter and cross section must be increased if there is to be an increase of the charge. If the cross section is increased, the electrical resistance would not be sufficient to obtain the necessary working temperature. If the diameter is necessary working temperature. If the diameter is necessary working temperature if the diameter is uncreased, the distance between the primary and secondary windings and the magnet cell in proportion and the losses due to dispersion would be increased. These difficulties were sought to be overcome in Germany by Richillug and Rodenhauser, and in Norway by Horth.

The Richilang and Rodenhauer furnace, like the

The Röchling and Rodenhauser furnace, like the Kjellin, is of the induction type, but with a single primary winding A around each iron core. The bath is in the form of a figure 8, with that portion of it D bying between the two cores of much greater width than that fying outside of it. The secondaries are two; one being its motion metal, and the other a copper winding B, which is connected with metal plates E in the furnace walls. The current passes from B through E and a mass G of highly refractory electric conductors, to the metal D in the bath. The metal is thus subjected to heating effects both by direct induction and by the current passing through the bath, between the opposite sate N describes the subjective N is a subjective to the proposities and N is described to the subjective N in the subjective N in the subjective N is a subjective N in the subjective N in the subjective N is a subjective N in the subjective N in the subjective N is a subjective N in the subjective N in the subjective N is a subjective N in the subjective N in the subjective N in the subjective N is a subjective N in the subjective N in the subjective N is a subjective N in the subjective N in the subjective N is a subjective N in the subjective N in the subjective N in the subjective N is a subjective N in the subjective N in the subjective N is a subjective N in the subjective N in the subjective N is a subjective N in the subjective N in the subjective N is a subjective N in the subj

HEBOULT ELECTRIC FURNACES IN OPERATION OR BUILDING,

MAI	BCH let,	1013.	
		Operating.	Production in tops per year
Germany	- 6	13	425,750
United States	4	Ð	164,500
England	3	4	77,500
Austria	8	4	46,500
Italy	2	2	41,000
Belglum	2		30,000
Russia		3	30,000
France	1	2	11,500
Sweden	,	1	8,000
Switzerland		1	2,500
Hungary		2	1,500
	^		
	91	41	N99 750

THE HEROULT ELECTRIC ARE FURNACE—We have no recently (SCHETURE AREAGEAN, June 7th, 1913) described the 15-on Heroult furnace as installed by the United States Steel Corporation at their works at South Chicago and at Worcenter, Mass., that a brief reference will estime in the present article. The Heroult furnace will estime in the present article. The Heroult furnace of the present article is an open-heart feetpale. It is no empresed as to have a titlen motion from the chapter of the posting side. The necessary

121/15 be 2011

imperature is secured by the flerce heat of an electric are formed between electrodes and the metal buth. The electrodes pass through the roof of the furnace and are maintained at the required distance above the hot metal by automatic, electrically-controlled devices.

The phosphorus is removed in the basic electric furince in much the same numer as it now is in the basic open-hearth furnace—by the use of time and oxide of iron. The resulting sing containing the phosphoras is tapped off, and a new entainting the phosphoras is tapped off, and a new sing of burned line and finor spar is formed. When the sing is motive, coke dust is added, and the resultinut carbide of calcium is produced. The free carbon, and, possibly, the carbide of calcium in the sing, with the aid of the carbon and manganese in the bath, eliminate the deleterious oxygen from the steet.

The advantage of this process of reliating is, that the resulting steel is free from segregation, is almost perfect in structure, and shows no exide or sing inclosures under the microscope. A similar furnace is in successful operation at Worrester, Mass.

That the electric furnice of large size is equable of turning out large quantities of steel, such for instance as are required for rall manufacture, is shown by the results obtained by the United States Steel Corporation, who, by the way, have expended in Horie experimental work, to date, over \$800,000. They have already produced about 1,0000 tuns of electrically-reflect steel rall, and most of it has been in service for the past three and one half years. During that time there has not been a single case of breakage, the steel, in addition to its purity, showing a remarkable toughture.

The great strides which have been much in electrical reduling during the post for revers me shows the reduling during the post for revers me shows the reduling during the post for revers me shows the reduling the post for reducing the post fo

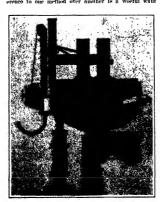
## The Measurement of Lights of Different Colors

PROF. HERRERT E. IVEN in two learned technical articles which have appeared in the Philosophical Magazine gives the result of an investigation into the photometric effects of lights of different colors. His results are interesting enough to present in a popular account.

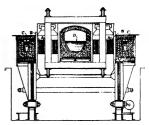
account. The advent of incandescent lamps of great efficiency and other new lights with a wide range of color, the prospect of an even larger variety in the near future which will diverge in that still further from present lluminants, all render the problem of measuring the imminosity of various hues, one of great importance. The mare comparison of two differently colored lights, is no more possible than its the exact comparison of sound with odor. Some nesholes, of course, have been discovered which in the process of measurement evade or eliminate the difference in hue. But different methods require different shandards and Dr. Ives promised to the process of the same methods require different shandards and Dr. Ives pro-

poses to obtain a relation between the various criteria.

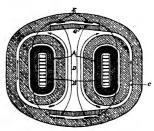
The chief obstacle, he says, in the way of giving preference to one method over another is a weeful want



The Heroult 15-ten are furnace at South Chicago,



Cross-section through Röchling-Rodenhauser



Horizontal section through Röchling-Rodenhauser induction furnace.

of statistics or data. These defects Dr Herbert Ives proposes to remedy. Of the methods of light measurement which have been applied to differently colored lights, one is the method of equality of brightness. Two colored lights limitation two portions of a background or photometric—measure of light—screen. The relative intensities of Hiumination from the two lights archanged until the two differently colored fields give n sensation of equal brightness. The illuminations are then said to be equal

The method of aculty of sight is merely the way of proving two colors squal when the same fineness of detail is just distinguishable by each, while the method of critical frequency holds that two illuminations are equial when the flicker produced by rapid alteration of one illumination with black disappears at the same speed of alteration as the other

speed of atternation as the other. Two illuminants are also said to be equal when upon rapidly alternating one with the other no sensation of flicker results. The speed of alternation is such that the slightest change of either will cause a flicker.

Dr Ives discovered that the lest standard must center uround the filcker and the equulity of brightness of the colors. So he then determined by the two methods the degrees of luminosity of the various tints and colors of the spectrum. The original findings of his numerous experiments are most helpful.

He found that the fifteer method is much more sensitive than the equality of brightness method, particularly where colored lights are concerned. The result with the fifteer method is more soully represented than with the equality of brightness plan. White decrease of illumination shifts the maximum of luminosity toward the blue in the equality of brightness method, yet with the fifteer method it whits toward the red

was the ficker method it shifts toward the red Decrease in the site of the measured field of light in low illuminations, shifts the maximum of luminosity toward the red for the equality of brightness—called the yellow spot effect—and toward the blue with the flicker method. The results are also most different at low degrees of illuminations upon large fields. They are merrest together at high illuminations and a small surface or field of light.

With the hope of shedding some light on the peculiarities of the flicker method, other experiments were carried out. Dr. Ives' results has served to clear up the seeming discrepancies of various observers, and these were brought into accord by proving that a change in experimental conditions yields changes in the results.

He also shows that the retina is found to be more sensitive to flicker furthest away from its central point, only on momentary observation before fatigue or adaptation sets in. The point of heat vision—the foves—is more sensitive to red flicker, the periphers or outside part of the relina, is more sensitive to blue lights. These differences are greatest at two degrees of limination.

## The Heavens in August

## The Summer Constellations: Jupiter's Satellites

By Henry Norris Russell, Ph.D.

S o far as predictable events are concerned, there will be little to attract the attention of the American ateur in astronomy during the coming month There is, to be sure, a partial eclipse of the Sun on August Blst, but the Moon is then so far north of the plans of the Earth's orbit that the central line of her shadow es the Earth by about 1,500 miles, and only the hern edge of the peuumbra (the region of partia shadow, from which only a fraction of the Sun's light ded) sweeps across the northern portion of our The region from which the eclipse is visible is therefore unusually small, including only Greenland, leeland, Labrador, Newfoundland, and the adjacent seas, with the extreme northern portions of Nove

The Sun, as seen from all these regions, will be low in the west at the time of celipse, and little more than one teuth of his diameter will be obscured. Nevertheless, granting clear weather, the eclipse should be dis-tinctly observable in Newfoundland, beginning a little after 5 P M. by Atlantic time (which is kept by the

rallways there), and lasting about half an honr. On the southern shores of the Gulf of St. Lawrence the ecity be nimost vanishingly small, but the very shallow notch in the Sun's northern limb may be observed with a field-glass (promay be observed with a held-glass (pro-tecting the eyes by smoked glasses) at about 5:25 P. M by Atlantic time (or 4:25 by Eastern Standard time). Unless the reader's holiday may insp-

pen to take him thus far afield, he will and to the planets Juniter and Uranus. but there is no lack of laterest here

Our map shows what stars are to be seen in the evening skies, and just where to look for them at the hour given below At an earlier hour all the stars (except those in the north below the pole will be farther to the east; i e., they will be higher up if in the western sky, lower down if in the east, and more to

the left if in the south, and so on.

The student whose wish is to be familiar with the summer constellations may begin by looking straight overhead Here he will see the Milky Way stretching from northeast to southwest right across the sky, and in it a large and conspicuous cross of stars of which the brightest is at the head of the figure. This is the constellation Cygnus—the Swan. It takes very little imagination to see the actual figure of a bird in this group of stars, the brightest star making its head, the arms of the cross extended farther by other stars, its wings, and the foot of the cross its tail. With this as a starting

point we may proceed in any direction. The line of the Swan's wings, extended toward the northwest, points to two bright stars, not far apart, which form the eyes of the Dragott. (β and γ in Drago on the map.) Much lower down, lu the same line, we come to the haudie of the Great Dipper; or, if we pref the tall of the Great Boar

if now we hold our map so that the Dipper is at the bottom, we can pick out at once every bright star in this part of the sky, find to what constellation it In this part of the sky, find to what constellation it belongs, and what Greek letter has been assigned to it, and trace the outlines of the constellation. In the same way we may proceed in any other direction from our starting point, finding lu the west the two very bright stars Vega (high up) and Arcturus (low de in the southwest the constellations Scornic, now very low, and Sagittarius; in the south, higher up. Altair and the other stars of the Eagle, and below it the fainter pair which mark the head of Capricornus; in the southeast the isolated bright star Fomalhant; iu the ens; the Great Square of Pegasus standing on one corner; and in the northeast Cassdopela and Perseus, both in the Milk) Way, and the latter just rising. less conspicuous constellations may now be identified with the uld of the map.

The observer who has a field-glass at his co will find interesting objects in the stars i in Uran Major, and a and \$ in Capricornus, all of double. The first two can be easily separated by the maked eye, but the faired whose companion is much failner, requires option aid. About half-way between a and 8 in Cygnus is another pretty pair, and a second

is close to the bright star Vega. The Great Nebula in Andromeda (shown on the map) is also easy to find, and there are fine star-clusters in the Milky Way be-tween Cassiopeia and Perseus, and in Sagittarius.

st interesting of all is the great planet Jupiter, which, though low in the southern sky, among the stars which, though low in the southern sky, among the stars of Sagittarias, outainse all else. This great brightness makes Jupiter a very striking object, even in a field-gias. It takes a powerful binocular, good focusing, a steady hand, and a trained eya, to see the plane? disk distinctly: but the assidities, especially the two outer of the four, are not hard to see. The beginner need not be alarmed, however, if on the fart night need not be marmad, nowever, it on the mrst ingot when he observes Jupiter, he can see no moons near it, or perhaps only one; for if the satellites are nearly in front of the planet or behind it, it takes a more powerful instrument to reveal them. A little patience, however, in watching the planet on successive nights will be rewarded. The third satellite, which is the brightest of all, can be seen on the east of the planet on August 1st, 8th, 15th, etc., and on the west

NIGHT SKY: AUGUST AND SEPTEMBER.

5th, 12th, 19th, etc., its period of revolution being 7 days 4 hours. The fourth, which is fainter, but goes almost twice as far from the planet, may be seen on the east side on the 2d and 19th, and on the west side on the 11th and 27th, and for some three days on either

The other two estellites are so much nearer the planet that they are not as easy to see with a small glass; and their periods are so much shorter that it is harder to keep track of them. The second satellite which completes a revolution in 8 days 13 hours 18 mlp course, west of the planet at the m

With this luformation, the observer may out which satellites were observable at any given time.
All calculation can be avoided by recourse to the Nautical Almanac, which gives diagrams showing exactly

where to look for all four satellites every night.

The fortunate possessor of a telescope three inch or more in aperture may find still greater interest in the study of Jupiter and his system. With such instrument, the vital forms of the planet's disk and the belts which cross his surface parallel to the equator are easily seen, and with a little care, it is possible to which the passage of markings across the surface, as they are carried round by the planet's rapid rotation. The celipses and transits of the satellites are fascinat-

ing, too. The approach of a satellite to the edge of Jupiter, and its disappearance into or reappearance from, the planet's shadow, can be watched with a small instrument. It takes a larger telescope to see the shadows of the satellites, as tiny black dots crossing the planet's disk, and a still more powerful one to see anything of the satellites themselves when in front of the planet. During the present month, the phenomena observable in the evening in the eastern part of the United States are as follows

SATELLITE I.

Is in front of Jupiter on:

August 7th, from 6:51 to 9:00.

August 14th, from 8:39 to 10:57. August 18th, from 10:27 to 12:45.
August 28rd, from 4:54 to 7:12.
August 28rd, from 6:44 to 7:12.
August 20th, from 6:44 to 9:02.
Is behind him, or in his shadow, on:

, or in life shadow, on:
August 6th, from 9:47 to 12:46,
August 18th, from 11:30 to 2:39,
August 18th, from 5:57 to 9:08,
August 22nd, from 7:45 to 11:68,
August 29th, from 9:35 to 12:58,
August 81st, from 4:02 to 7:20, NATELLITE II.

Is in front of Jupiter on:

August 4th, from 7:25 to 10:15.

August 11th, from 0:44 to 12:34.

August 18th, from 12:05 to 2:55. Is behind him, or in his shadow, on August 13th, from 3:54 to August 20th, from 6:17 to 11:07. ist 27th, from 8:42 to 1:45.

Satellite III. comes out of eclipse at 11 520 on the 7th, goes behind the planet at 8:35 on the 14th, comes out again at 11:51, and disuppears into the shadow (which, as seen from the Earth, lies on one side of Jupiter) at 12:17 the same night. It may also be observed to disap-pear behind the planet at 12:07 on the

Satellite IV. can be seen going into eclipse at 11:88 on the 15th, and going in front of the planet at 10:28 on the 23rd

All the times in the above table are given (as in the Nautical Almanac) Washington time, which is eight minutes slow on Eastern Standard time. It will be seen that the most interesting date of observation is the 14th, when two satel-lites are hidden at once, the first in front of Jupiter and the third behind him.

The planet Uranus is now also very well placed for observation, his position utes 44 seconds of right ascension and while that on the 80th is 20 hours 27 min-

utes 29 s provided with detailed star maps may caslly flud him provided with detailed star maps map (saily mud him with the sid of three small stars in Capricornus, which may be found by drawing a line from a through  $\beta$  Capricorni, and prolonging it to the southward not quite twice the distance between them. These three stars, c, wand a Capricorni, form a nearly equilateral Due east of them, at about the same distance as that between a and  $\beta$  Capricorni, is another faint star, v Capricorni.

so stars are between magnitudes 5 and 51/2 s of the 6th magnitude—a little fainter—and Uranus is of the 6th magnitude—a little fainter—and lies about 1 degree south of the line joining v Capri-corni to the triangle. The lower side of the triangle points almost straight at him. At the beginning of the month he is about twice as far from the ringing so the month he is about twice as far from the triangle as from w, but at its end he is nearer the former. He can only be seen with the naked eye on a very clear dark night, but is conspicuous in a field-glass. The neighborhood of these good reference stars makes this an unusually good time to hunt for the planet.

Of the other planets, Mercury is in conjunction with

the Sun on the 3rd, and cannot be seen until the latter the Sun on the 3rd, and cannot be seen until the latter part of the month, when he appears as a morning star, in Cancer, rising before 4 A. M. He tig at his greatest apparent distance from the Sun, 18 degrees 28 minutes, on the 22cd, and should be easily visible.

on the Mand, and should be easily visible.

Venus is morning star in Gentlar, rising about 2 A. M. and acceedingly bright. Mare is likewise a morning star, in Taurus, rising about midnight, and appearing a little brighter than Aldebaran. Saturn is close by; (Concluded on page 89.)

A STATE OF THE STA

or about Man driven by an aeroplane ter, and with it be has a speed of 15 miles per h made a speed of 15 miles per hour. The eance is 18 feet-iong. In the forward end these is a light framework which supports the propeller shaft carries a 8-toot aeroplane propeller which is driven at 800 revolutions per minute by a 7 horse-power twin-dylinder engine. opeller shaft is belt-conn The propeller shaft is belt-connected to the engine shaft. Is order to give the cause sufficient stability it is provided with pontoons, one at each side, as shown in the illustrations. coops aid in balan cause when the engine is being cranked, but when the cance is under way they just clear the water of this craft has given it the name, "air

Cody and His Proposed Transatlantic Flight

IN an endeavor to capture the London Daily Mail's prize of \$50,000 for the first aviator to cross the Atlantic within 72 hours, Col. F. S. Cody, the well-known Anglo-American airman, is building a shydroaeroplane in which he bopes to cross the ocean in 20 hours. In order to do this he will have to average at

ch lies between England and Newfoundland.

It is believed by those who have made a study of he question that the first flight will be made without a the que stop, as the high waves of mid-ocean would prove dis astrous to flying machines of the present day. The problem of deciding from which side of the water to start is also occupying the attention of those airmen who intend to compete for the prise. Starting from England, a fiver would travel with the sun and wou have daylight for about 22 hours, while a start fro Newfoundiand would give him only 14 hours of light. However, he would have the advantage of the prevniling western winds in mid-ocean.

## Richard Börnstein

THE death of Prof. Richard Börnstein on May 18th removed a conspicuous figure from the circle of German meteorologists. Although he was professor of physics at the agricultural high school of Wilmersdorf (a suburb of Berlin) he had for years devoted his at-(a signific of berinn) he had for years devoted his at-tention almost wholly to meteorology, especially the practical side of the subject. To his efforts chiefly was due the organization in Germany a few years ago of a system of weather-forecasting and map-publishing stations analogous to those of the United States Weather Bureau. Among his voluminous writings was an admirable elementary textbook of meteorology, a new edition of which had just appeared at the time of his death. For many years Börnstein was editor of the first two of the three annual volumes of the "Fortschritte der Physik"—a publication that is indispenable to every worker in the physical aciences. He was
a member of the recently organized International Commission on Agricultural Meteorology.

## Armature-winding Machine

RESIDENT of St. Louis, who for years has been A engaged in the electrical repair business, has re-cently built a machine for rewinding small armatures. device takes either diametrical or chord windings in either straight, twisted, open or overhung slots, and it may be adjusted to the armature in two or three minutes. It consists essentially of a universal two-jaw chuck which holds the armature while it is being would. The jaws are shaped to guide the wire into the slot. Between the jaws are two scrow stope which are adjusted to fix the point at which the jaw arrip the armsture coil, so that when the slot on one side is set and the core is held against the slot, the other slot will line up with the opposite jaw. The jaws are tightessed upon the arpasture by means of wrench wheels of such preportions that the operator cannot readily scret to much pressure on the delicate core and damage the teeth. The machine is operation may be slipped on the shaft of a small perior, say 1/6 lorset property is 500 to 460 revolutions per simute, and prefreight is should be provided with a fort controller mich as used on sewing tachnic motors. The device may also be introduced with a fort controller mich as used on sewing tachnic motors. The device may also be introduced with a fort controller mich as used on sewing tachnic motors. The device may also be introduced with a fort controller mich as used on sewing tachnic state made over the control of the terms of winning the magnitude with some fill the terms of winnings, the instead of the terms of winnings, the factor is proposed with the edges of the The jaws are shaped to guide the wire into

AND THE STATE OF T



Cause driven by an air propeller.

is we overhanding the teeth of the slots a trifle. The jawa overhanding the teeth of the slots a trife. The device is then turned and the wire is automatically fed into the proper siot. When the first coil is fishished, the wranch wheels are loosening, and the core is turned to the next slot; when the next evid is wound, and so on, until the suttree winding is completed. For arms-tures with twisted slots the jawa may be adjusted to the proper audie. With a device of this kind resist on small armatures, which formerly had to be done by hand, is now greatly expedited.

## The Tin-plate and Terne-plate Industry

TATISTICS for the fin-plate and terus-plate indus-STATISTICS for the implace and remember of try in the United States for 1909 are presented in detail in a bulletin soon to be issued by Director Harris of the Bureau of the Census, Department of Commerce. d under the supervision of William M. It was prepare Stenart, chief statistician for manufactures

Tin-plates are thin plates or sheets of steel or tron.



Automatic armsture-winding machine

known as black plates, coated by dipping in a bath of molten the.
Terne-plates are black plates control, in like manner, with an alloy of tin and lead known as terne mixture. the proportion of tin varying from 10 to 35 per cent. The term "terne is taken from the French, and means dull or tarnished. On account of the lead in the mixture terne-plates are much dulter in appearance than tlu-plates, sometimes known as bright plates.

Ttn-plate manufacture involves two radically different pro the rolling of the black elates and the dipping of them in the or terms mixture The manufacture of black plate ts a rolling-mill operation, and the bulk of the dipping is performed by the dipping departments of such rolling intils.

Of the 34 autabltshments to the combined industry in the United States in 1900, 27 both rolled black

plates and dipped them, three rolled black plates but had no dipping departments, while four were engaged in tin and terms dtoping only. The number of each of these groups of establishments was smaller in 1900 than in 1800; but the decrease was greatest in the number doing a dipping business only, and the num-ber making black plates will no dipping departments. There has been a growing lendency to consolidate the two branches of the business

The net value of all products of the black-plate mill and dipping establishments in 1900 was \$65,378,580, of which amount the value of the and terms plates represouted 70.1 per cent. In 1904 the value of the ttn and terme-plate product formed 800 per cent of the net value of all products of these establishments, and in 1809, 75.7 per cent. The value of products of the ludustry was 58,2 per cent greater than in 1890. value added by manufacture—that is, value of products less cost of materials—was \$22,948,150 in 1909, and the number of wage carners, 18,956.

## Higher Electric Lamp Efficiency

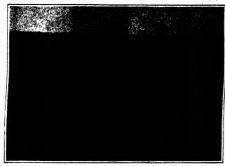
N EW incondescent lamps which contain especially shaped tungsten filaments and are filled with nitrogen at a pressure of about an atmosphere, will soon be obtainable. The types which it is expected to develop first are adapted to comparatively high current consumption, six amperes and above, and operate at an effi-cioney of half a watt per candle-power. This is fully twice as high an efficiency as the most efficient incan descent lamps heretofore available. The new lamp The new lamps promise to be of particular value in a field not heretopromise to be or particular value in a neu not hereto-fore covered by incandescent lamps, and should greatly broaden the applications in which they can be used advantageously, particularly in the direction of very large candle-power units

## The Cost of Orchard Heating

THIS is the subject of some elaborate statistics by thilly answering the question "Does frost fighting pay in I'tah?" Assuming 30 degrees as the temperature w which heating is necessary, he finds that for the first degree-i e, to heat from 20 to 30 degrees the cost is 60 cents per nore per hour, while further fall of temperature the cost increases 40 cents per degree per acre per hour. Thus to heat the orchard to the sufety mark with a temperature of 20 degrees the cost is \$4.20 per acre per hour. It is also assumed that if the temperature falls below 20 degrees, the crop cannot be saved; and this may happen after a large amount of fuel has been expended. Again, the business of firtug presents many chances for small leaks of one mother, and much nunccessary firing to apt to ne in the attempt to err, if at ull, on the safe side. Finally, there is the question whether the scot-laden and smoke-covered pollen can continue its work of fertilization. Some of the growers who in the just have fully" fired their orchards have now abandoned the practice. On the whole, Mr. Alter's deductions are couraging, so far as his observations in Utah extend. hnt of course do not, necessarily, apply to other parts of the country, where frosts are less frequent and of the country, where frosts are less frequent severe, or where fuel and labor are less expensive.

Earthquakes and Rainfall .-- It has been cor that excessive atmospheric precipitation might favor the occurrence of earthquakes by increasing the supply of subterranean water, leading to a washing away and col-lapse of portions of the earth's crust Count de Montessus de Ballore has published in the Comptes Rends results of a painstal results of a painstaking comparison between 4,136 earth-quakes and the rainfall conditions preceding them. He concludes that there is no relation of cause and effect

## SCIENTIFIC AMERICAN



Pantodon, or African flying fish.

Brazilian meen fish (Pterophyllum scalare).

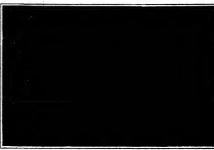
## Curious Exotic Fishes By Jacques Boyer

The breeding and keeping of small excite Biles of strange forms, strikling colors and curlous habits has been greatly promoted in Germany, in recent years, by the efforts of enterprising Hambarg importers. At present several French placefultratts are endeavoring to make this custom, of Chinese and Japanese origiu, popular in France.

gin, popular in France.

The aquaritums of M. Lefèvre, in particular, are filled with rare and superb specimens, brought from China, Japan, Africa and South America, some of which we have succeeded, though not without difficulty, in photographing in characteristic attitudes.

Let us first examine the telescope fish, which Carbonnier tried to acclimate in France forty years ago. This monstrous variety of carp, a creation of the Chinese and Japanese fish breeders, who are past masters in the art of deforming nature, has an almost globular glistening body gilded on the sides, double dorsal fins and a long tail of peculiar shape. Its eyes and their sockets are very prominent and re-semble the object glasses of telescopes, whence the name telescope fish A carp possessing titls abnormal feature was discovered in Japan in the sixteenth century, since which epoch the peculiar churacter has been perpetuated and combined with many variations in form and coloring, by cureful selection and crossing. By these means, combined with ingenious processes and devices which it would be tedious to describe in detail, the Japanese breeder have succeeded in preserving various individual peculiarities. In order to increase the protuberance of the eyes, for example, the fishes are kept in an aquarlum which is dimly lliuminated by light coming from a single point. The eyes of the young fry are normally formed.



A Japanese telescope fish, the "fan tail."



Bengalese catâsh (Sacobranchus singio).

The variety known as Yea-tan-yen or "well tail" preserves the normal structure of the eye during life, but its delicate, transparent tail attains an enormous size and fails in graceful folds, like a veil, producing effects that a "serpentine" dancer might envy, when the little fish moves in the sunlight.

Other Japanese varieties of the telescope fish are the "sheep's nose," which owes its mane to the convexity of its body; the "jag's snoul," which has a head resembling those of Asiatic swine, and the "fan tall," which raises and spreads its

tail in the manner of a fun-tail lyigeon. The Chinese breeders of telescope fish disdain these abnormalities of structure and devote their attention chiefly to coloring. By modifying the temperature of the water, and by impregnanting it with lime and iron, they produce startling shades and markings. Among the immunerable varieties thus obtained we may mention the "spotted," with a beily of silver, and sides and back marked with bine, yellow, black, rose and carmine dots; the crimson "ruby" and the "superh," with gift-edged scales, scarlet belly, and black or bright red markings on the back.

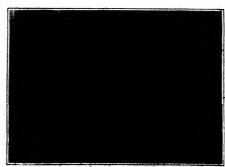
The globular form of all telescope fishes makes their equilibrium very unstable and their movement awkward. They are very subject to mainformation of the swim-bladder. Some individuals swim on one side, others on the back, because of displacement or atrophy of that organ. Some, called "tumbler higeons, others seement is the bottom of the water. In the case of hypertrophy of the swim-bladder, on the other hand, the fish remains at the bund, the fish remains at the surface.

Telescope fishes breed well in captivity, but as they devour their offspring they should be removed as soon as the eggs are laid. The young fry are fed, first with dried and pulverized silkworm pape,

(Concluded on page 99.)



A South American sel (Sternophygus).



Armored catfish (Piecostomus Commerconi).

living beings is illustrated by such facts as the radia-

tions from the centrosome of a

cell about to di-

tric invers lu s

gralu of starch, the successive layers of wood in a tree Irank, or the

havers deposited

Similar structures

thal is, radia-

lions-can be ob-

tained by purely

luorgunle pro cesses For ex-umple, if a drop

placed in a suit solution, the dif-

solution, the dif-fusion will pra

ceed in all direc-tions (Fig. 1),

and the appear-

will resemble that

of an electrical neld on the one

hand (Fig 2).

and the radiations

abont a nucleus

often seen in a living cell. If two

drops of ink are

solution, near each other, the diffu-

sion currents be-

tween the lwo

drops will take on

the appearance of

a magnetic field between twa

poles, or that of a

"spindle" formed during the divi-

sion of a cell nucleus (Fig 6).

In a 10 per cent

solution of gelatin

## Dead Matter That Seems Alive

## Synthetic Ideas About Life

By Benjamin C. Gruenberg

rejected upon the nature of the elephant, after making a thorough investigation, to the effect that this animal is like a tree trunk, like a rope, and like a fan. This story was no doubt invested by some ancient oriental sage to show the failacy of generalizations based on fragmentary and unrelated experiences. When

chapter is an excellent one on mechanism versus mystictanguer is an excellent one on mechanism versus mysti-ctsm, in which we are reminded that scientific progress is made possible by escaping from magic words and for-mulæ into the path of trial and measurement. Of course the author rejects all forms of vitalism, and seeks to assimilate life processes to more familiar physical and chemical processes. Then he develops the idea of dyna-

mic centers, starting with Faraday's fields of force. Throughout the book there are excellent reproductions pholographs illustrating structures and movements obtained experimentally by diffusion in increasic solutions, in comparison with electrical and magnetic phenomena on the one hand, and with cellular phe-nomena on the other. The idea of dynamic centers in

Dr. Stephane Leer thirteen years ago, began his experiments with diffusion, he did

not claim to have physical basis of life; he was con-tent to point out merely the curious similarity between the diffugelatin and the cesses in fiving beings. Well trained in the metho modern science, he did not confuse the rone-like structure and the elephant: he said simply that the rope is like—nut an elephant, but like a certain part of an elephani. iarity with os-mosis and diffu-sion increased, he discovered more and more points of resemblance be nomens on the one hand and what happens in living organisms on the other. And gradually be has acquired the hal of thinking and speaking as exceptially of a rope, a couple of fans and three or four tree trunks

phant. In his introduction to the second volume in his series of studies in biophysics
—"la Bioligie Snythet i q u e''s - that his work is an interpretation (of life) based upon experimental facts. The book itself is given over a description of mets, and to a tain classes of There is very little in the way of interpre-tation. The first

a synthetic con-

\* 1912. A. Poinst, publisher. 121 Bonlevier St. Michel, Paris For All Ports

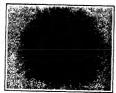


Fig. 1,-Diffusion of India ink in salt water.

Fig. 2 .-- An electrical field of force

Fig. 3.—Striated diffusion lines × 500.



fusion of cur-rents be-tween two poles of dif-ferent con-



Fig. 7.-Striated structure re-sembling a grain



-Electrolytic figure suggesting a fern frond.



Fig. 11.-Crystallization figure;



—An electric dis-which resembles a

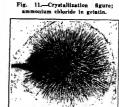


Fig. 12 .- Modification of diffusion currents by contact of a glass rod, illustrating irritability.



5.—Gunglien nerve cell, by ser after the method of Golgi.



Fig. 9.-Four at sive stages in "kary-okinetie" figures produced by diffusion.



Fig. 13.—"Negative heliotropism" of diffusion currents of India ink in sait solution.

containing a trace of calcing chloride or nitrate, a mixture of equal parts of saturated solutions of sodlum carbonate phosphate is placed. The diffusion proceeds in delicate lines, that iridescence may be observed Fig. 7 shows the concentric waves, giving the appear ance of a grain of starch. The irl-descent strintions suggest similar phenomena in the feathers of the peacock, in the

in mother of

## The Airman and the Weather

Aeronautic Meteorology: A New Branch of Applied Science

By Charles Fitzhugh Talman

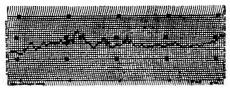
A ERONAUTICAL meteorology is to the A aeronaut what maritime meteorology and hydrography, together, are to the mariner. That it is destined to play an all-important part in the navigation of the nir is so obvious us to require no demonstration Taking this for granted, there are, however, certain questions to be answered in order to fix the status of this branch of knowledge in the aeronautical curriculum. How much, actually, do we know about the laws of the atmosphere bearing on aeronautics? Has the science reached a practical stage, or is it still so tentative and uncertain that, for the pres ent, the individual aeronaut should it upon his personal experience as a safer guide than the generalized knowledge now available? Is the meteorologist still, as formerly, learning more about the free stmosubere from the seronaut than the atter is learning from the meteorologist?
If for any reason the world became in-

terested in blowing soap bubbles we should not have long to wait for an exhaustive "Lehrbuch der Seifenblasenkunde" from 'Hernany It was in the normal order of events that a German gave us the first text book of aeronautical meteorology', and that we are promised from the san pen a companion work on aeronautical climatology; but it is sufe to say that few meteorologists were prepared to find in Dr. Linke's pioneor work a complete new branch of applied science, emiodying a wealth of information not only useful, but indispensable, to every person who risks indispensable, to every person who risks life and limb in navigating the air. This book fully answers the questions we raised a moment ago. Aeronautical meteorology has arrived.

The present writer has reviewed Linke's book in the SCIENTIFIC AMERICAN (June 24th, 1911, p. 630, and April 20th, 1912 n. 308), and it is not necessary to repeat bere what has already been said about its many merits. The young German author, though himself a practical aeronaut ns well as a meteorologist, is of course primarily a mere spokesman for the scientific aeronauts of his country, and his work reflects credit upon many besides himself. Our purpose now is simply to himself. Our purpose now is simply to cite a few facts from the work in question, and from other recent literature, serving to show to what extent meteorserving to show to what extent meteorology is already prepared to take up the new tasks imposed upon it by the sudden efforescence of the art of aeronautics.

It was a providential circumstance that

meteorologists had made a substantial seginning in the systematic study of the upper air a few years before the invention of the first practical scroplanes and diri-gible balloons. The new science of acrology—i. e., the survey of the atmosphere throughout its vertical extent, by all possible methods—dating, as a coherent body of knowledge, from about the beginning of the present century, pushes its investigasome three bundred miles above the The bulloonist, in extreme cases, earth. The bintoomst, in extreme cases, rhese 6½ miles; the aviator, 2½ miles. Thus it happens that much of the matter of aerology has no direct bearing on aeronantics. Even the remarkable isothormul lever, or stratosubere, the discovery of which, in the year 1902, marked an epoch in the history of science, lies at an altitude that it is doubtful whether any human being will ever travel whether any numan being will ever traver up to its lower boundary; though it is now almost daily entered by unmanned halloons carrying self-registering instru-ments. As to the lofty regions, beyond the reach of the sounding-balloon, in which the atmosphere is no longer "air." but hydrogen, or helium, or "geocorou'F Linke, Aeronauticoke Meteorologie, 2
tols, Frankfurt u. M., 1911.



Gustiness of the wind. Shown by the record of a Richard anomocine.

The speed of the wind at each moment is here registered in meters mograph.



"It is notorious that the greatest enemy of all kinds of air-navigation is the thunderstorm; . . . not only because of its electrical dangers, but because of the strong vertical air movements by which it is attended."—Linke tion is the th

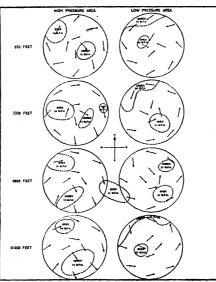


Fig. 3.-Variations of the force as d the direction of winds at different altitudes in high and low-pres

ium." or what-not, these are of no more practical concern to the serial navigator than to the procesic wayfarer on.

However, in order to reach the stratosphere every sounding-balloon must pass through the troposphere, and all ascents teorological kites are confined with in this lower stratum. Thus the great bulk of the data acquired by the aerologist pertains to regions accessible to the acro-

Before all things else the aeronaut is interested in the wind. The combined tical engineer have completely upact old-fashioned ideas concerning this element. No longer do we think of a wind as a steady horizontal stream of air, in which steady horizontal stream of air, in when every particle is moving at the same speed as every other particle. Such a wind would be a boon to the aeronaut if it existed, but it does not—as was first conciusively proved by Langley, and as is shown in the record of every aerological observation. In the first place, a wind is rarely horizontal, but has, instead, a more or less pronounced vertical com-ponent, of which the ordinary wind-vane and anemometer give not the slightest token. In the second place, no wind is absolutely steady or homogeneous; and most winds are quite the reverse. When two anemometers are place a few feet apart, one of them may, for a tirlef period, indicate a velocity twice as great as the other. Moreover, a single nemometer, if sufficiently delicate, will now incessant fluctuations in the strength of the wind. This "gustiness" is not well brought out in the records of the ordinary registering anemometer, but it is strikingly shown in those of the Dines pres-sure-tube anemometer, or the Richard anemocinemograph (Fig. 1), or the apparatus attached to the winch of a meteorological kite for recording the tension on

That the wind commonly has a vertical component, that gustluess is the rule rather than the exception, and that great variations in velocity occur from one place to another, are facts that the seronaut would soon find out for himself. It is the business of the meteorologist to tell him under what conditions he may expect these features to be most pronounced or most persistent, and what limiting mag nitudes they may assume.

For example, the meteorologist teacher the aeronaut to distinguish the typical forms of clouds, for the very practical purpose of enabling him to recognize those forms which are characteristic of vertical air movements, and those which denote mainly horizontal movements. A cumulus cloud is proof positive of the existence of a strong ascending current beneath it; while in the intervals between neighbor ring cumpil the air is likely to be sink-ing. Prof. Humphreys has happily de-scribed these vertical movements as "aerial fountains" and "aerial cataracts," and has shown that they are among the numerous causes of the so-called "hole in the air."

What maximum speed may be attained by vertical air currents? This is a question that the aeronaut would hardly care to have answered by a personal encounter with the extreme case of the phenomenon. The meteorologist, with the statistics of almost innumerable observations at his nmand, is able to tell him that ascendor some to test min that ascend-ing currents sometimes move at the rate of 25 or 30 feet a second, and that these rapid movements in the vertical occur-especially in connection with thundersalls. Furthermore, the met

(Concluded on page 1012)

## Inventions New and Interesting

Simple Patent Law: Patent Office News: Notes on Trademarks

## An Electrically Controlled Two-speed Rear Axis Design for Motor Cars

W FTR the constantly increasing cost of gasoline, status and status of the constant of the con

Now, however, there has been developed by a prominent Detroit automobile manufacturer a novel type of electrically controlled two-nieed, or two-gon, roar axie that bids fair to solve the eternal fuel problem in addition to having several other advantages of importance. The idea of the two-gear rear axie is not new, of course, for as long ago as 1907 the trillein Flat Commany filed application for patents on a device of the kind; and since then two other foreign and at least one ether American manufacturer have taken it up. The first American device appeared in Chicago at the automoble show early this year.

The method of controlling the goar changes in the new arie that has just been brought out, however, is herand new; nothing like it has ever been altempted before. Prior to the appearance of this axis, gour changes in other axise of the kind have been under manually by means of a lever similar to the ordinary transmission gear-set lever. In this new axis, which is illustrated herewith, the gear changes are unde with the aid of magnets controlled by a small button placed conveniently at the driver's hand. Hence, to obtain either high or low gear requires merely the depression of the button, no other movement being required.

In construction, the new axie is much like the orthon pattern of rear axie except that it has two bevel rings and two bevel plutous instead of one of each lone of the heavy plutous is connected to a solid shaft which is curried on hearings inside a hollow shaft to which the other bevel plutous is attached; the generate constantly in much and the magnets operate constantly in much and the magnets operate

Just how much the new axis may be expected to decrease feel consumption may be anthreed from the fact that the use of the high sear rule increases the range of part 42 per cent with the engine revulutions remaining constant. For instance, with the engine turning at 10 proveolutions a minute and the low goar in use the speed of the cer will be approximately 21 unles an hour, whereas with the high even in use the car speed will be approximately 30 miles an hour. In other words, the car will travel unless further on a given amount of fuel with high sewr in use that it will with the low goar in use. The high sear always a final ratio of 2.5 to 1 and the low gear a ratio of

The lucrosse in mileage, of course, is supplemental to decreased were and tear in the parts, due to the slower speed at which they operate when the high gear is in one. Also, engine whreation, which always countrates a measure to the life parts, is matrially reduced at high car aposts. The new arise is being used as standard equipment on all of the cars produced by the manufactured for the 1914 seems.

## A Test of Milking Machines

There recently took place in England a competitive to of mitting machines under the acquires of the Royal agricultural Society. Thirteen machines were entered. The winning machine, manufactured by swedish company, is built on the vacuum or suction principle. The milk is conducted by transparent collisional control of these to the containing vessel which is hung under the cow by means of a girth, and the milking is performed in manch the same way as will nother vacuum machines. While a vacuum or suction principle machines were ruled out after the first class of the same vacuum or suction principle machines were ruled out after the first trial, and that after the second three more were eliminated, the remaining two taking first and second

## The First First Assistant Commissioner

C. BILLINGS, who has the distinction of being the first First Assistant Commissioner of Pat-



A two-speed direct drive axle for automobiles



Gasifier inclosing part of the exhaust



Gasifier connected by flexible tube with the exhaust,



Automobile lamps that swivel like an eyebali.

Nh, 1999, by President Tuft on the creation of the office, has resigned the position to take effect August Illet, 1913. Mr. Billings' service as First Assistant Commissioner, follows that of Assistant Commissioner, to which position be was appointed June 1st, 1997, by President Boncevelt, and a torn of service in the Pate ant Office extending continuously from his appointment as Fourth Assistant Examiner ander Ctvl Service on May 24th, 1809, with the exception of a short period when he accepted a commission as ensign in the Navy for service in the Patentrous and efficient officer and resigns the service to enter upon the practice of patent law in New York Ctv.

## Distillate Gasifiers for Motor Vehicles

Tille cost of fuel for motor trucks is cut to less than Indiff by the use of gasilters, extendively employed on commercial vehicles in Culifornia. The gasifiers are placed on the engine in such a way as to heat the cartureter nature; just before it is delivered to the cylinders, and in this way it is possible to secure excellent results with distillate. The gas is delivered dry and hot and ready for combastion with the same regularity as gasoline, and carbonization, caused by imperfect combustion, is practically elliminated. The cost of gasoline in Los Angeles is 17 cents a gallon, while distillate soli at only 7 cents a gallon and delivers 25 per cent more power. This effects an enormous saving to owners of motor trucks in the course of a year. Owing to the odor of distillate, it is not used on ptenarre vehicles.

Two types of gardiers are in common use in California, both based upon the same principle. One consists of a large casting boiled to the engine, inclosing
part of the exhaust. The coasting is perforated as that
the air which enters the entiructer passes over heasted
metal before being combined with the distillate, and
the nixture from the carbureter passes vibrough the
hot cylinder on its way to the cylinders, being delivered
at a temperature of 100 degrees. The other consists of
a cylindrical brass custing filled with tubes like a
holder. This is attuched between the entrureter and
the cylinders and connected with the exhaust through
a leight of flexible tubing. The air is not hoasted before entering the carbureter as in the other type, but
the mixture passes over the boasted tubing before reaching the cylinders. In using both types, an auxiliary
tank of gasoline is curried for starting the engines,
though it is not required for starting, while the gasi-

## A Portable Controller for Electric Cranes

IT is reported from abroad, that a new method of controlling crauses has recently been introduced ou the docks of the Munichester ship canal and at other points in England, in which the crane controller instead of being operated from the cab of the crane as heretofore, is portable, weighing but sky or eight pounds, so that it can be suspended from the shoulders of the operator, who can then occupy an advantageous position with regard to the work, move about and see what is taking place in the hold of the vessel. In the past he has had to depend on signals given by a man standing at the hatchway. The controller is provided with a past swift. To stop in an emergency, it is uccessary for the operation only to hit the knob of the push awtich to bring the crane motor to a stop. The invention not only facilitates the operation of the crane, but effects a material economy by disponsing with the necessity of the signalman employed at the lintelway.

## Strange Headlights from France

A NEW automobile beadlight has just been put on the market in France, which represents a radical departure from present designs. As will be seen from the accompanying litherations, the imap has the shape of a human eyeball and turns to its socket in exactly the same numer as the eye in its support. Two small clamps, controlled by thumbscrews from the interfor of the ear, hold the lamp in position in may desired direction, while the handle lised is used to turning the light may be the spot of the ear, hold the lamp in position in may desired the light may to the spot they are needed. Signposts at the side of the rand or the low-lying intentones are thus brought within reach of the rays, while in their lowest position they even throw light into the hood, lighting up the motor, magneto and carbureter. By removing the two small clamps entirely, the whole lamp can be taken out of the socket and itsed as a "trouble lamp" inside or outside the machine. It is the invention of a Fracel senjmer, Educard Chamsool.

Jake T

## Notes for Inventors

A Wave Motor for Propelling Be Patent No. 1,066,896, to John Frame of Searsport, Maine, shows a boat equipped with a motor so constructed as to drive the propeller shaft of the boat upon the rise and fall of the boat by the action of

Four Signature Writing Machine Patents.—A series of four patents, Nos 1,066,115 to 1,066,118, inclusive, has een issued to Frank Amos Johnson of Jersey City, assignor to Signature Comof New York city for machines for writing a number of signatures and duph cates, at the same time.

A Glider Instead of a Roller-skate natent has been issued to John H. Koenig New York city, No. 1,067,039, for a glider which is in the nature of a skate having relatively flexible portions for the sides thereof with curved gliding surface somewhat similar to the "domes of silence" employed on furniture

A Tubular Corrugated Rallroad Tie. Ernest J. Pettegrew of Wayside, Neb., has secured a patent, No 1,086,943, for a metallic railway tie which is in the form of a tube continuous throughout and has corrugations extending entirely around it between the rails and also outside of the rails with the intermediate spaces for receiving the rails free of corrugations.

A Brake Shoe Patent.—In patent No. 1,066,119 to Harry Jones, of Suffern, N. Y , sesignor to American Brake Shoe and Foundry Company of Mahwah, N. J. is shown a flanged brake shoe in which a metallic body portion contacts with the tread of a car wheel while a flanged portion of non-metallic material is provided to contact with the flange of the wheel.

A Novel Method of Producing Ozonized Air. -A patent, No 1,086,065, has been issued to James Todd of Sewickley, Penn, for a method of producing so-called ozonized air. The amount of air passing to the ozonizer is varied according to the temperature of the surrounding atmosphere, and is reduced as the temperature ris and increased as the temperature falls.

Advertising Device to Create Illusions. George H. Schanck of Libertyville, Ill., has secured patent No. 1,066,850, for an advertising device which simulates perotion and employs a revolving wheel, suitably driven, and having arms which are proted to swing and upon which balls roll back and forth in such manner as to increase the effect of the device being a perpetual motion machine.

A Combined Bottle Stopper and I George J. Dysinger and Johnnie C. Haskell of Galena, Ore , in a patent, No. 1,060,172, present a staple embedded in a bottle stopper and a separate part formed from a single length of wire and bent to provide a hold for use in pulling the bottle, the puller being connected with the stopper stable and such puller also having arms formed to engage with the shoulder on th bottle neck to hold the stopper in the bot-

French Kitchens .- It is reported that a leading merchant of Havre recently made in his store windows a display of his idea of equipped kitchen for a family in comfortable circumstances. While it has been conceded from time immemorial that the French nation leads the world in culmary skill and economy, it is a tribute to the ingenuity of Americans that six articles of American manufacture were included in the equipment of the ideal kitchen displayed by this French merchant These six articles included an ice-cream freezer, an ice pick, a hashing machine, a cake-baking mold, a coffee pot and a broom.

A Gyroscopic Dumbbell.—A gyroscopic dumbbell hav been patented, No. 1,058,786, to Burt L. Newkirk and Otto S. Zelner of Minnespolis. The device includes a dumb bell with a shaft journaled in it and gyro scopic disks on the shaft providing an respire disks on the snar providing an exer-eising device which is free from attachment to any apparatus and when held in the hand is capable of offering resistance to motions

made by the user whenever such n would tend to change the direction axis or axiss of the rotating masses. ch meticos

Planting Artificial Hair in the Se Aurel Popovies of Torok-Kanlson, tria, has patented, No. 1,059,831, a m m, Å116 of imbedding artificial hair in the scalp. A retaining element is applied to the hair and a minute cavity is pierced in the scalp. The end and the retaining element of the hair is inserted in the cavity below the surface of the skin, so that hairs can be planted in the skin with, the inventor claims, such a degree of perfection as to render the artificial nature of the hair covering thus produced completely unnoticeable

An Improved Brick Tie.—Consul Van Sant of Dunfermine, Scotland, reports that a builder in Dunfermline has recently invented a new type of wall tie and that invented a new type of want the and time, while the tie formerly used gripped but two bricks, the improved tie will catch a half dozen bricks giving additional strength to the wall, requiring fower ties and resulting in a considerable saving in the used in large operations. The so be seen before the wall is plast The tie and thus avoids any dispute about using fewer bricks than the number specified by the architect.

Another Hulett Conveyor Patent.— George H. Hulett of Cleveland, Ohio. assignor to the Wellman-Seaver-Morga Company of the same place has patent stem for unloading cars into ves a system for unloading cars into vessess.

This includes appliances for tilting the car and dumping its contents. A motor-driven, automatic-dumping car receives the load from the first car and an elevator the load from the first ear and an elevator lifts the automatic dumping car to an elevated treatle which has a chute into which the contents of the dumping car are discharged. The dumping car is returned to its starting point by a suitable downwardly inclined track. The patent is No. 1,066,015.

Egg Packages .- Think of a gross retaggs.—Inink of a gross of million broken eggs. Such is the yearly erop of broken eggs marketed in New York city alone. Of course, this includes York city alone. Of course, this includes the breakage in packing, the breakage in transit and the breakage in unpacking. It is probable that the breakage in packing and unpacking equals that in transit. It is reported that the Department of Agriculture is investigating the subject. The problem presented its an interesting one problem presented is an interesting one to inventors. The package of course, must not be too expensive and the packing and unpacking operations must be capable of accomplishment with facility as well as

Patent and Trade-mark Registration in the Philippines.—Under an act passed at the last session of the Philippine Legis lature any patent or trade-mark register in the United States Patent Office, up being filed in the executive bureau of the Philippines and the fee for such purpose paid shall receive the same protection ed in the United States, and persons infringing such patent or trade-mark shall be liable to the same penalties. It is provided that the rights of property in patents and trade-marks secured in th Islands under the Spanish Laws shall b respected as if such laws were in full force

A Sanitary Milk Bottle. -Realizing objections from a sanitary point of view to the ordinary milk bottle, Merritt G. Seamans of Atlanta, Ga , has patented a lining for nulk bottles which may be of paper or other suitable material and can be slipped down into the bottle and will be expanded by the force of the liquid inserted therein and has a portion which is bent over and down along the outer side of the lip of the bottle. A closing disk may be inserted as manal.

Talking Moving Pictures,-Henry Theo Taking Moving Pictures.—Henry Theo-docrope Regester Webb of Baltimore, Maryland, has secured patent, No. 1,026.— 324, in which motion picture and sound-

seing devices with the drive member produce unison of action between as to pro to as a produce unusus or souson network ble pleture device and the sound repro-tion without change in the relative speeds under fluctuations of speed derived from the drive member.

A Toggie Spoke Spring Wheel.—In patent No. 1,065,386, to Frank J. Nicolet of Stockdale, Ohio, is shown a spring wh in which sectional spokes composed of two sections pivoted together at one end and nivoted respectively at their other ends to the rim and hub are arranged to connect the hub and rim. Springs are disposed to act on the outer sections in such manner as to permit the wheel to yield under pressure and at the same time tend normally to hold the hub at the

Synchronizing Motion and So production.—Edward H. Amet of Redondo Beach, Cal., has secured a patent, No. 1.065.576. in which is shown a motion oture machine with a film provided with perforations on lines between the picture sees and means are provided to supply seumatic pressure on the picture ribbon This procumatic pressure operates through the perforations in the picture film to actuate electro-pneumatic means which control the operation of the sound reproducing machine, thus securing a sychronou

Advertising Novelty.-Dorsie A. Loh of Woodlawn, Pa., has patented, No. 1,-061,302, as an advertising novelty, a mega-phone which is adapted to be collapsed into pane which is adapted to be collapsed into the form of a fan and to be held in such form so that it can be used as a fan, the megaphone having a telescopic mouth-piece which may be adjusted to serve as the handle of the fan.

New Needle for Talking Machine.—In patent No. 1,061,408, to Percy B. Rug-gles, of Wyoming, O., is shown a reproduc-ing needle for talking machines which is made from the shaft of a feather with the barbs removed, such shaft possessing an outer shell with a softer interior, the structure being artificially hardened to render it more desirable.

A Trick-playing Card .-- A playing card which can be made to show clubs or spades at the will of the holder is illustrated in a patent, No. 1,061,576, to George W. Walter, of New York city, assignor to Edgar G. Walthall of same place. The card comprises a face card having clubs marked thereon and openings adjacent to the clubs and forming with the clubs the outline of spades and a sliding card which has por-tions the same shade as the clubs and other portions the same shade as the stubs and other portions the same shade as the ground of the face card and the sliding card can be moved to place either of said portions in register with the openings in the face card.

A Removable Dental Bridge.—Harry A. A semovable bental Bridge.—Harry A. Gollobin and Newton A. Bornstein of Newark, N. J., assignors to The Dental Denture Improvement Company, of the same place, have patented, No. 1,062,233, a removable bridge for teeth in which the bridge has a bridge to teem in which the bridge has flat split tongue or resilient material, the branches of which engage within a recess in a crown portion of a tooth, so that the bridge will be securely held in use and yet can be removed when necessary.

A Steinmets Incandescent Lamp.-The well-known inventor, Charles P. Stein-metz, assignor to General Electric Company, has patented an incandescent lamp ent, No. 1,062,305, in which an meandescent conductor is disposed within an evacuated envelope and supplied with cur-rent and means provided for furnishing gas-absorbing material during the opera tion of the lamp by the disintegrating tion of an electrical discharge taking place across a portion of the evacuated space.

Nickel-in-Slot Telephone System .- The dore Crapo, of New York city, assagnor to George Reguester Webb of Baltimore, Automate Electric Company, of Chicago, Maryland, has secured patent, No. 1,120;- as assigned of John Erickson, also of Chicago, Charlest Company, of Chicago, Charlest Company, of Chicago, Particle Company, of Chicago, Particle Company, of Chicago, Particle Company, of Chicago, Particle Company, of Chicago, has secured a patent, No. 1,026,287; relatively different appears and a divier is provided for establishing a talking circuit provided in connection with a governor-body country of the Company of the Compa

mid lines is arranged in com means for rendering the talking direct inoperative and mean ne are also prov olled by depositing a plurality of coins in the coin-collecting device, for rendering the talking circuit operative.

A Combined Smokestack and a Life-A commune smoonestack and a late-preserver.—A life-saving device is shown in a patent, No. 1,081,209, to William Monroe White of Milwaukee, Wis., in the form of a ship stack which is detachable and is formed with an air-tight compart ment. As shown, the stack is flattened transversely and has an air-tight compartment at each of its two more flexed sides and the stack when detached and in the water may operate as a life-preserver or life-raft, its capacity varying with its sise.

A Cover that Operates a Valve.--In patent No. 1,062,209, to John L. Williams, Jr., of Jackson City, Tennessee, for a sani-tary drinking fountain, a hinged cover is tary drinking fountain, a miged over a arranged to close the drinking oup and this cover operates when opened to open the supply valve, such valve being closed auto-matically by a spring when the cover is closed so that the water only flows when the cover is raised by some one desiring a

## Legal Notes

Patentability of Process as Related to Apparatus.—The Court of Appeals of the District of Columbia in re Rowe has susof Patents in rejecting the application and held that the claims were properly refused on the ground that they are merely siments in different words of the inven eovered by applicant's prior apparatus, the Court saying: "An invention is not made different by the mere fact that one is disclosed in a claim for an apparatus patent and the other one in the form of a method or pro

Employer and Employee.— The case of Jameson and Yesbera v. Ellsworth, de-cided by the Court of Appeals of the Distriet of Columbia, brought up an interest-ing point. The appellant Yesbera was the president of the Yesbera Manufacturing Company, while Jameson was a fore-man of the company, and the appellee Ellsworth general manager of the company at the time of the conception and reduc at the time of the conception and reduc-tion to practice of the invention. The Court stated that as between Yesbera and the appellee Ellsworth the prosump-tion of inventorship was in favor of the employer, but that before such rule might be invoked, it must appear that the employee was engaged in perfecting a device under the general direction of the employer; that appellee was not employed for the purpose of perfecting this or invention and that hence it must be affirma-tively shown that at least the broad idea was disclosed to Ellsworth by Yesbera before the presumption referred to would attach

The Commissioner's Right to Review The Court of Appeals of the District of Columbia in the case of Moore, Com-missioner of Patents, et al. v. United States ex rel. Chott. has confirmed the Commissioner's right of review after favor-Commissioner's right of review after favor-able decision by a subordinate tribunal. The case arose in a pocular way, the Board of Ezamiser-in-Chief on appeal reversing the decision of the Primary Examiner and deciding the claims to be patentable, whereupon the Primary Examiner acting by authority of the Commissioner, me an additional investigation, cited additional patents and the Commissioner took up the case and approved the action of the Primary Examiner. The applicant sought the aid of a mandamus wit in the Supreme Court of the District of Columbia and Mr. Justice Barnard of such Court granted the writ to compel the issue of a patent to the applicant. On appeal the Court of Appeals has held that the Comcourt of Appears has need that the com-missioner has authority to review the appli-cation and if in his opinion the alleged in-vention is not patentable to refuse a patent

o that mandar

substituted for the remedy offered

refor; a

## RECEIVELY PATENTED INVENTIONS

These columns are spen to all patentees. The notices are incerted by special arrangement with the inventors. Terms on applies than to the Advantaing Department of the Schurzert American.

## Persaining to Apparel.

EMBECIDERED APPAREI.—W. Farso, 102
Pitth Ave, Manhatten, N. Y., N. Y. This invarious attains in object of constructing a
on-piece garment of different jueces suitably
membershered design, and sub-reddering the
article so that portions of the embroidery will
be the seam.

ble the seams.

SHOW CLEANNER.—W. J. LLOTE, MachatLEA, N. X., N. X. The purpose here is to previde a cleater harder both receive very
the state of the control of the control of the control
to member will be invested as desired relation of the control of the control of the control
by a shown away from each other and sgainst
the tension of resilient means.

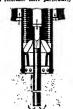
The custom to continue in the continue of the

operative position.

ORCHARD STEP LADDER—C HEWETT,
Box 289, R. F. D No. 2, Wessatchee, Wash
An object of the lavestor is to provide a step
ladder in which strength, lightness and right
y combine to make the ladder especially convasient for use in orchards, and in work generally among trees and shrupe.

## Of General Interest.

DEVICE FOR SINKING STHANDERS—C L. HOUSTON, room 312. Astoria Savings Bank Bidgs, Astoria, Ore This invention relates to incease used for sinking a strainer in a well, and has reference more particularly to a de-



DEVICE FOR SINKING STRAINERS.

vice of the class comprising a tubular member through which water is forced and which projects through the bottom of this strainer, and means on the tubular member and in said amenda on the tubular member and in said strainer whereby the weight of all the tubes extrained whereby the weight of all the tubes a strainer to help the shining of the strainer take primer to help the shining of the strainer rapidly in the weil.

rapidly in the well.

BOX COVER FASTENING.—C T JEEE
WEIN, Blackhawk, and CHARLES W. DOR
LIN, 219 East Main Street, Madison, Wis
Address the latter, same place The in
vention is an improvement in the class of de



BOX COVER PASTENING.

vices for securing lids or covers of boxes with-out aid of nails or screws, a metal keeper be-ing hinged to one end of the box body and

out sid of natis or screws, a metal keeper being blaged to one sud of the hox body and
particular the cover has been put in place.

PROPER OFFICHT CO. B. JOHN. Respipue, La

The invention has particular reference to a
mass for securing a constant and regular delivery or flow of water from a reservoir or
side. More particularly it conducts of a monas
for delivering definite or regular quantities
from a nain canal for me by partice tributary
to such canal for invitation purposes.

KINTRI, case and for M. KINDRY & Co. 1 W. 98418

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KINTRI, case of M. KINDRY & Co. 1 W. 98418

KINTRI CO. 1 W. 9841

DERIP WELL PUMP, —W. S. CRIBINGRAM, 485 Cherry St., Springfield, No. The object have is to provide a pump of reciprocal, double-acting type, which will give a continuum stomewhere the continuum of the continuum



DEEP

parts of the pump being so positioned as to form an easily extractable unit readily acces-sible for inspection and repairs. This is car-ried out by a pump comprising two concentric cylinders froming the predestranded voluminal clearance, a bellow reciprocetting piston in the inner of said cylinders, and automatically oper-ated inlets and outlets associated with said cylinders and piston

ready and convenient
COMBINED TOWEL HOLDER AND LOCK

—G litto, Osage City, Kan For the purpose
of holding and securing towels in toilet and
other rooms in such manner as to prevent remoral without interfering with their convenicut use, the invention provides the towels with
system and strings them on a har or roof which



orted in and locked to a fixed support

is supported in and locked to a fixed support, and to whose outer end a relatin is attached, warling the support of the suppor

undne strain

AUTOMATIC WATER STERILIZER L.

VOGE, TI (VORISI Park West, Now York, NY
This invention relates to apparatus officestcooking unposes, and particularly refers to
a means wherely water may be sterilized or
purified without defracting from its natural
proportion with respect to its proper pleasant
tasts

taste
AIPARATUS FOR PRODUCING ETHER—
D. ANNARATUS, Settino Toriores, neer Taris, italy. The invention relates to an apparatus for producing steer, the purpose being to reader the apparatus highly productive, and comparatively clean to operation, seprendily as a specially as a garder the quantity clean to operation, especially as a garder the quantity of fuel and manual labor required.

## Hardware and Tools

Hardware and Tools.

CRIMINIS TOOL.—J. Woon, 143 Seventh
81, Long island City; N. Y. N. Y. This tool
18 tools are toold tools to the control of the control

jewel to be set in watch plates, settings and the like, so that the tool will automatically cut or turn out the seat of exactly the proper

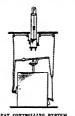
ROOF SQUARE.—P. N. BERGGREN, San Jose Cai. The object of this invention is to provide a square especially fitted for roof work but equally well adapted for any work whereix



an ordinary or bevel aquare may be used, which will be easily manipulated to Indicate the correct angle, and locked in the required postition, and which when not in use may be folded into small compass

## Heating and Lighting.

Heating and Lighting.
AITOMATIC SAPETY WATER GAGE FOR
ROHLERS.—S MINNOW, Fowler, Ozero Co.
Colo, This automatic gas is arranded to preColo, This automatic gas is arranded to premain varie for replacing a worrout gasket to
prevent the gase from leading when is use preHERAT CUNTROLLING SYSTEM — P. P.
IRRAT CUNTROLLING SYSTEM — P. D.
Inventor is to provide a best controlling systom
in which a thermostar control is so interconnected with a displaragm control that all
though the thermostar control hash operate



HEAT CONTROLLING SYSTEM.

to maintain the living-room temperature at the predetermined value, the disphragm control will under any and all conditions prevent the thermostat control from causing to be gener-ated within the heating boiler a pressure of steam exceeding a predetermined maximum

Household Tuillies.

FOOT AND INAD REMT FOR TUILLY REATE—W. B SHMORRN, 713 FINDS SH, TRONGHY, IN THE INTENDED AT THE INTENDED



AND DISH WARMER

arranged to permit convenient storing of food and dishes with a view to keeping the same hot for any desired length of time, and to per-mit the disers to hely thanselves to the vari-ous foods. The patent is for sale.

WINDOW SHADE BRACKET .-- L. G. RIF

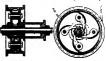
ENBERICK, 476 First St., Albany, N. Y. This invention provides means for adjusting the bracket arms to suit shades of different widths, and thereby avoid the damage to window frames caused by repeated fastenings of



brankets at different points on the frame. Means provide for adjustably supporting the Means provide for adjustably supporting the state of the supporting t

## Machines and Mechanical Devices

POWER TRANSMISSION MECHANISM.—
L MAIER, care of Mrs. J. G. Orlib, Santa Rosal House, 4th and San Pedro St. Los Angeles, Cal. This invention relates to driving mechanism and has reference more particularly to



POWER TRANSMIS

mechanism of this kind constituting a one-way citeds, and comprising a drum, a ratchet assortiated therewish and means wherevity the dram moved in one direction and are important with respect to each other when moving in autotice direction. The patent lu this case is for sale

Frime Movers and Their Accessories.
ENGINE — J Zeitala, 737 Columbus 8t, 6rrand laven, Mich The capille is of that type in which rotary audien of the regular sidelity-connected sections which represents adultive connected sections which represent rectificantly as a unit in steam exerted siterately on openite sides threat, and in which the linear section reciprocetes rectificately in movement by steam admitted alternately at opposite affect of the linear section the redgracial international latternation and international section in the section of the control of the control international control international section in the section of the control in the section of the control international section in the section of the section in the s

## Railways and Their Accessories.

Hallways and Their Accessories.

REPARATOLI—REBERS WILLIAMS C. B.

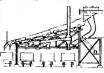
TITUS, and H. W. LINDENSOFER, HARRISHEE

H. Address the first The invention embodies the use of a suction apparatus for the

purpose of cleaning and curveying small coal

or coal dust from the larger sixty, and deposit

ting the servedings or fine stuff in a cer or



COAL SEPARATOR.

COAL SEPARATOR.

Other receptacle The saction apparatus is used in commetton with silvating servens white effect a preliminary separation or gradual content of the preliminary separation or gradual commetter of effective. To remove this defect these inventors provide means for subjecting the screened coal of the various sizes to the action of an att suction apparatus which staff here is not separate to small content of the servening set. The staff here is the servening set of settlements of servening settlements of settlements settlements and settlements of settlements set

the other track out of line with the continuous track.

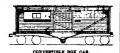
the other track out of line with the continuous track.

RAIRCAD TID:—W. B. O'Brains and E. J.

QUINN, Kenocha, Win. The sim of this invention is to provide an inexpensive reinforced

which will form a sould support for the rail and other proper resistance to the variable stresses produced by the rolling stork and at mospheric conditions.

COMBINED LOCOMOTIVE TANK VALVE AND GOOMED LOCOMOTIVE TANK VALVE AND TO THE CONTROL OF TH



the outer ends of the movable floor member so that grain disposed on movable floor member any be directed to the hopper to empty the car. These movable floor mombers have hinged portions, which may be raked to remove the grain which may full between the floor mem bers and sides of the car. With this car, grain may be quickly unloaded, and at comparatively ittle expense.

## Pertuining to Vehicles

Pertaining to Vehicles.
AttromOBILE TIRE—A Proquet, 218
Flushing Are, Brooklyn, N. Y. The invention relates to spring tires adapted to be employed on the wheels of automobiles and other vehicles as a subsettiet for possumate tires. The tire blocks, retractile springs secured at their inner sade to inner ends of the tread holes, at the latter's side, these blocks baving side groover in which springs are disposed, and retaining springs outer ends being secured to the retaining means.

apring's outer onds being secured to the retailing means.

DEMONINTABLE RIM.—W J. Laws, care of J. C. Wilkes, Saley State Rt, Slaron, Ps. The
invention referse perficularly to a Exad and rebeautiful to the security of the security of

NOTE,—Copies of any of these patents will be furnished by the RCIENTIFIC AMERICAN for ten cents each Please state the name of the patenter, title of the invention, and date of this paper.

We wish to call attention to the fact that we are in a position to render competent services in every branch of pattent or trade-mark wort. Our staff is composed of userhanders worth of the staff is composed of userhanders of the staff is composed of userhanders of the subject matter involved, or of the specialized, technical, or elentifies knowledge required therefor, we associates throughout the world, who assist in the prosecution of patent and trade-mark applications field in all countries foreign to the braided States of the special control WE wish to call attention to the fact that

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Kindly keep your quaries on soparate sheets of paper when corresponding about such matters as patents, subscriptions, books, etc. This will greatly facilitate answering your questions, as in many cases they have to be referred to experts. The full name and address should be given on every sheet. No attention will be paid to unsigned queries. Full hints to correspondents are printed from time to time and will be mailed on request.

(12822) S. R. axia: Given the earth a perfect circle of diameter. Also miles. A this steel band is fitted just tight account the equator, and then cut spart. A strip i feet long is inserted and the cut spart. A strip i feet long is inserted and the band wedded together. It is then placed concentre with the sarth. Whas is the sarther of the carb. A. If the circumference of the carb is concerned by 4.0 feet. This is found by dividing it by 3.1461, the number 2 of the surface on the carb. The surface of the circumference of any drive over long-those over long-those of the circumference of any drive over long-those over

the circumsference of any excellar were lengtheses by 14 fort. The without of the space between the process of the sacht would be the saches where the sacht was been subjected.

(L2833) I. S. O. sake: A base-ball is thrown into the air I to couples 4 seconds in decenting. Over what space has in fallest in the sacht would be interested in the sacht would be interested in the sacht with the sacht where the sacht was a sacht was a sacht where the sacht was a sacht

(12832) S. R. asks: Given the earth a compared with the earth? A. The mean diameter exceeded of diameter 8.000 milles. A thin for the moon is 2,183 miles, and that of the earth test band is fixed that fact the earth of the moon is 2,183 miles, and that of the earth test band is fixed that fact the earth. The fixed concentrate with the earth. What is the thicked concentrate with the earth. What is the thicked concentrate with the earth. What is the thicked concentrate of the earth revolution of the earth is place is as follows: I the earth when the cause of the earth when the cause of the earth when the cause of the earth when the course of the earth of the earth when the covers the year of the earth when the covers the product of the earth when the covers the earth when the covers the concentrations of the earth when the covers the concentration of the earth when the covers the

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A SAME TO SECURE

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Money Changing. An Introduction to Foreign Exchange. By Hartley With-ers. New York: E. P. Dutton & Co., 1913. 8vo.; 183 pp. Price, \$1.75

Co., 1913. SVO; 120 pp. Times, el.1/1 Determination of the money of other countries—is effected for money of other countries—is effected four as it has else of any commodity of commerce, and, like other commodities, is effected by the law of supply and demand it would be the commodities, and the commodities of the countries of the commodities of the countries of the commodities of the countries of the countries

HEATON'S ANNUAL. The Commercial Handbook of Canada and Boards of Trade Register. Ninth Year. 1913. 8vo.; 401 pp. Price, \$1 net.

8vo.; 401 pp. Frios, \$1 net.

This Annual is one shoot in a well-planned system of publicity almost toward the upputtle got the Domision and of the Empire 1 is destinctly framed with the intention of saving time and money for invertors, mere as a saving time and money for invertors, mere a saving time and money for invertors, mere a saving time and money for invertors, mere a saving time and the saving immigration. Officials and boards of trade throughout the Domision have besettly coperated in making the work authoritatival and full.

ECONOMY AND SYSTEM IN THE BAKERY. By Emil Braun. Cincinnati: Stewart & Kidd Company, 1913. Svo.; illus-trated.

trated.

Mr. Breun is well qualified by his long experience to give bakers a handbook that shall be of great benefit to them, whether their businesses be large or small. As the author points out, economy and system in the small baker; is necessary before the foundations of a larger business can be laid. Chemiton of a larger business can be laid. The laid of the control of the larger business can be laid. The laid of the owns, necessary before the foundation of a larger business can be laid. The laid of th

HOW TO INSTALL ELECTRIC BRILLS, ANNUCLATORS AND ALARMS. BY NOTERAN H. Schmidter, New York: Spon & Charles, Sponson and Charles, Sponson and Charles, Charles, Sponson and Charles, Sponson and Instruction on betteries, wires and wring, circuits, pushes, built, builting abarras, high and low water alterna, for alactus, thermoretae, and the location and remerciping of troubles.

ARTHETIC LEATHER WORK. A Handbook on the Art of Decorating Leather. By E. Ellin Carter. New York: 8pon & Chamberlain, 1912. 16mo.; 51 pp.; illustrated. Price, \$1. Leather work is an art of ancient lineage, and one which lead itself well to the highest and most satisfying expression of issue. The prove here to be benefitted by the authors of the control of the cont

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to sent free an request. This explains our
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TRADS MARKE, POREGON PATENTS, etc.

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## Classified Advertisements

TO-PNEUMATIC SWIMMING BELT.
Iffeting on adjustment. Weight 1 th. Polds
phone are previous and leven of adjustment.

D.—One purson such locality ame Polish Moon, Self-Wringings Brooms, Line camel be of Co., 1866 Grand Ave., Ohioan

WRITE ADVERTMEMENT weekly. We can positively a to increase your salary. From

INQUIRIES

The Heavens in August

(Concluded from page 90.) in fact, the two planels are in conjunction on the 24th, and little more than 1 degree on the seth, and fittle more than I degree apart. Saturn is the farthest south, and is a little the brighter of the two, while Mara is moving eastward more rapidly, and so overtakes the larger planet. This conjunction will be a very pretty sight, but one must get up in the morning to

see it. Finally, Neptune is in Gemini, lately past conjunction with the Sun, and ob-servable only in the morning. On the 29th he is in conjunction with Venus, being but

18 minutes north of her.

The Moon is new at 8 A. M. on the 2nd, in her first quarter at 11 P. M. on the 2nd, in her first quarter at 11 P. M. on the 8th, full at 3 P. M. on the 16th, in her last quarter at 7 P. M. on the 24th, and new once more at 4 P. M. on the 31st. She is nearest the Earth on the 3rd, and again on the 31st, and farthest away on the 18th. As the new Moon at the end of the month almost coincides with the time of perigee, unusually high spring tides may be expected.

While completing her circuit of the skies

the Moon comes into conjunction with eptune on the 1st, Mercury on the 2nd. Jupiter on the 12th, Uranus on the 15th, Saturn and Mars on the 26th, Venus and Neptune on the 28th, and Mercury again on the 80th

Chamonix France

## Curious Exotic Fishes

then with minced boiled rice or vers celli, and earthworms twice weekly.

The Sacobranchus single, a little cat fish found in Bengal, is distinguished by its bristling mustaches from its compan-ions in the aquarium. The gray, striped Sternopygus is a South American sel of

tric properties and having a single ventral fin. Somewhat similar to both of these in form and movement is the African nomystus, six or eight inches in length which is a native of the river Niger and requires a temperature of about 80 des

The armored catfish (Piecostomus Com merson() is a remarkable member of some European collections. The sides of this fish are covered with dark colored scales arranged like roof-tiles, and a long plate protects its head. The dorsal fin is very

The Brazilian moon fish (Pierophyllum solure) is an variegated in color as it is enrious in form.

todos, a diminutive flying fish found to Lake Tchad, in Africa, merits especial attention because of its peculiar structure and singular habits. It owes its name to the formidable array of teeth which cover its tongue and the principal which cover its mouth, in addition to the jaw-bones proper. The dorsal fin is very short and is placed near the long and pointed tail. The folding pectoral and ventral fins are very large, and the latter ventral fins are very large, and the latter terminate in fine filaments. These organs suggest great powers of flight, and, as a matter of fact, M. Fourneau, of the Lake Tchad mission, has seen the partodon rise from the water and, by flapping its pectoral fins, traverse distances of 5 to 20 yards, or more. These are long flights for a fish only two or three inches in length. In the aquarium the Pentodon remains quietly at the surface in the atti tude shown in the photograph, which, un fortunately, cannot reproduce the gorgeon livery of this butterfly of the water. The back is clive, in some specimens crossed by transverse dark bands; the belly is slivery yellow, tinged with carmine; the fins are bright pink dotted with violet brown, and the tips and inner surfaces of

the pectorals are violet-hued.

It is impossible to mention here all of It is impossible to manifold here all of the ecotic fashes of comparative recent importation in the possession of M. Lestves, M. de Visses, and other members of the purpose of promoting the cult of oranpurpose o



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## Kissed by an Angel

The story of a wooing unparalleled in romance—"ANGEL ISLAND," by Inez Haynes Gillmore, in THE AMERICAN MAGAZINE

A desert island-five shipwrecked men-five winged women -- the fierce attraction -- the longing to capture -the old, old clash between man and woman-the great sex problem of our day - the Feminist Movement. A story of profound significance, told with dignity, power and illuminating frankness.

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The August Fiction Number, containing the first instalment of ANGEL ISLAND, is now on the stands. It is as worthy of the attention of the reader as any magazine published anywhere, at any time. Among the contributors:- David Grayson, James Montgomery Flagg, John Taintor Foote, A. B. Frost, Frank E. Schoonover, Margaret Widdemer, Edmund Vance Cooke, George Fitch, Arnold Bennett, Hugh S. Fullerton, Stephen Leacock, John A. Moroso and the brothers Kolb.

The August Fiction Number of



## SOLDERS and SOLDERING

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ve description. The male fish builds a tiny nest of foam, into which he ences the female by assuming a nuptia livery of the most brilliant coloring, but as soon as she has deposited her eggs, he drives her away and takes upon him the duties of the mother and nurse, to which he devotes himself sealously until his offspring become able to find their food This maternal instinct of male is strongly developed also in the chanchito (Heros facetus). One of these curlous fishes in the aquarium of oue of curious innes in the adartum 5 dec or my friends had a brood of sixty little ones, which he defended valiantly, promptly attacking and biting any finger that was rashly plunged into the water The worms and raw beef on which the young fishes were fed were chewed fine by the father, and an amusing spectacle was ented by the little ones taking their food from their father's lips.

Some exotic fishes are even more bril-liant in coloring than those described above. The orange-colored cost of the Scatophagus argus, for example, is adorned with artistically arranged dots of velvety black, and a beautiful azure bead marks every scale of the Brazillan (Sch-

It might be supposed that these living s of tropical waters require constant e. Ou the contrary, they can be kept without trouble in an ordinary dwelling or apartment. Although M. Lefèvre, who propagates these exotic fishes on a large scale, has installed his aquarlums in two hothouses, and Mme, Kuhnt conducts an elaborate pisciculturai establishment near Berliu, M de Visser keeps his fishes in tanks of about 25 galions capacity ou a veranda, where speci very different dimensions and origin dwell

The proper water temperature (about 70 deg. Fair for most species, and 80 deg Fahr, for a few others) is maintained. usually, by means of an alcohol lamp con-tained in a nickel-plated cylinder, which is ballasted so that it floats in a vertical ssition with its open top, which is cov ered by a fine wire grating, aloue emerg ing from the water. The aquarium may also be heated by lamps placed in a lower unpartment, separated from the tank by double partition. Large and pugnacion fishes, and some others at the breeding n, are confined singly in gla-In marked contrast to domestic fresh wa ter fishes, which do not thrive in captivity unless they are kept in running or frequently renewed water, these exotic fishes may safely be kept for mouths in an aquarium without a complete change of water. It is sufficient to draw off one teath part of the water every week, and to replace it with an equal quantity of fresh water of the proper temperature. Adequate aeration, however, is essential. This may be effected very easily by placing in the bottom of the aquarium the end of a rubber tube, communicating with a sed air cylinder, in which a pres sure of three atmospheres, as indicate an attached manameter, is maintained by means of an automobile tire pump. The immersed end of the tube is closed by a thin membrane, which is traversed steady stream of minute air bubbles.

The sandy bed of the aquarium is plant d with Vallimeria, Miriophyllum and other green aquatic plants which are use fui as weii as ornamental, as the in oxygenating the water, afford shelter to the fishes and facilitate their reprodu

The cultivation of exotic aquartum hes deserves every encouragem it is not only a source of enjoyment, but it offers a field for scientific observation of the curious and still imperfectly studied habits of these pretty little creatures.

## Dead Matter That Seems Alive (Continued from page 98.) earl, in tendons, in voluntary muscle

Beers and in other organic structures. A section of stricted structure, produced by diffusion currents is shown highly magnified in Fig. 3.

The general appearance of a cell, with its nucleus and plasmic streaming, with



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uclear division figures, with various kinds of outgrowths, had been described by Leduc in earlier writings, together with the comotic growths of varigesting molds, sea-weeds, toadstools Both series of phenomena were re ed to and illustrated in the Scientific AMBRICAN, September 9th and 23rd, 1911.
Fig. 4 is a reproduction of one of Leduc's "artificial" nerve cells, shown alongside of a ganglionic cell (Fig. 5) prepared by De-moor according to Golgi's method. Leduc's "cell" was produced by placing a "seed" consisting of two parts of copper sulphate and one part of cane sugar in a solution of ferrocyanide of potassium. A precipitate of copper ferrocyanide is formed on the surface; this is impervious to sugar, but water is readily absorbed through it, leading to "growth" in all directions, the final form depending upon the precise distribution of the particles of sugar and of copper sulphate in the grain, upon variations in the density of the medium, etc.

Much of the argument in the book is devoted to showing that the lines of dynamic discharge are essentially the same in an organism and in organic media. To this end illustrations are derived from a comparison of electric discharges and crystallization figures with ferus and other plant structures. Fig. 8 is the elec-tric discharge resembling a leaf; Fig. 10, an electrolytic pattern suggesting a fern frond; Fig. 11, a crystallization of ammonium chloride in gelatin suggesting plant forms; Fig. 9, four successive stages in "karyokinetic" figures produced by diffusion; Fig. 12, a modifi diffusion currents by contact of a glass diffusion currents by contact of a name rod, illustrating irritability; and Fig. 18 shows "negative heliotropism" of diffusion currents of india ink in sait solution.

With wonderful patience and ingenuity Prof. Leduc has taken up in turn the mmonly recognized characteristics of living cells—their structure, their absorption of nutrients, their nuclear division their irritability, the circulation, the relation of temperature to function, their transformation of energy—and has reproduced each phenomenon in turn in a aration which is admittedly "non-living." But has he thereby made an approach to the artificial synthesis of life? All that we can learn from these experiments is as evident in the world of living things as in the world of non-living; that motion here is along the line of least resistance as it is there; that the mechanics and th electrics and the chemics of living colls are the same as those of non-living sas

The chapter on the origin of life and cous generation is a same statement of the problem, and to it Dr. Leduc points out the logical necessity of assum-ing that life not only did originate "spontaneously"—in a scientific sense—but may do so again under suitable conditions. He also points out the evasion of the issue involved in such theories as that of Arrbenius in regard to the extra-terrestrial

Whether the methods of Ledne ever whether the methods of Leduc ever reach the bottom of the problem or not, these experiments have their value in clearing the field of much conjectural rubbish and confusion; and as for the synthesis-that has not yet reached the experimental stage.

## The Airman and the Weather

(Continued from pape 84.)
is now able to draw a vertical plan of the thundersquall (Fig. 2), tracing its quasi-circulation about a horizontal axis, as a guide to the maneuvers the airmas should adopt if overtaken by a storm of this character. This is strikingly anaiegous to the task of the nineteenth of plan of the cyclone, and teaching marinar how to avoid the "danger marinar how to avoid the "danger of the

Theorems the serminal based horizontal work of the serminal based horizontal work of the serminal plans of the valid against the serminal plans of the valid against his limit for encounter-original and a serminal plans and the serminal plant and the serminal plans and the serminal plant and the serminal plant and the serminal plant and the serminal plant and the se 



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neters, Pyremeters, reters, Wattmeters, Tachometers and 



other members of the atmost tion. He needs to know, for example, the relation of the winds to the isobars at various levels in a typical cyclonic disturbance. It is a distinct advantage to him to learn that, while at the earth's surface to learn that, white at the earth's surface the 'winds blow spirally inward toward the center of a depression, at the mile-level overhead they are no longer inclined inward, but blow in such a direction that the isobars on the surface weather map correspond approximately with the n of a free balloon at such a level. Thus aeronautical meteorology, which is a science of three dimensions is vestly science of three dimensions, is vacty more complicated than marine meteor-ology, which is a science of only two. Let us repeat, however, that in spite of the magnitude of the tasks imposed

upon it, aeronautical meteorology has already reached a stage of great practical utility. A single illustration will make this clear. Suppose plans were on foot to establish a regular airship service across the Atlantic, where would be the most favorable route? Meteorology is ready to answer this question. For the westward journey there is one region, and one only, in which the winds are favorable through out the year, viz., the trans-wind best. For the eastward journey a sea-level wind chart, might suggest the advantage of a more northerly route, in the sone of "prevailing westerlies." Accology, however, can better this suggestion. The winds of middle latitudes, although westerly in terms of averages and resultants, are actu ally subject to the vicissitudes attending the frequent passage of cyclonic disturb ances. There is only one region in which there is a tolerably steady drift from west to east, and this is the zone of the antitrades,3 lying vertically over the trade winds. Hence the first transatiantic airships will probably sail from southern Europe to the West ludles at a low level and return in the same latitudes at a level a few thousand feet higher. The tropical hurricanes that occasionally invade this region during the late summer and early autumn will be announced by wireless telegraphy from the meteorological bureaus, and the aerial liners will give them a wide berth-or possibly rise to the upper level of the storm itself and take advantage of the outflowing winds at that level to get away from the storm center. Aerologists have now been at work for several years sounding the air above the trade-wind belt. The trades are found to be quite shallow, and their depth varies

be quite annion, and their depth varies considerably with latitude. We have not space here for even the most summary digest of the science of aeronautical meteorology, but must limit ourselves to an enumeration of its principal subdivisions. We have already de-voted considerable space to the wind, as the subject of capital importance. Under this head let us add that valuable statis tics have been compiled as to the varia-tion of the force and the direction of the wind with aititude (see, for example, Fig. 3); that the average windiness of various places on the earth's sur-face has been determined, in order to point out the most favorable locations for aerial harbors and aerodromes; that the relation of the winds at mederate altitudes to the topography of the land has been worked out in great detail; and that ingenious forms of apparatus (e. g., the vertical anemometer and the pilot-balloon) have been devised, to supplement the ordinary anemometer and wind-vane for aeronautical purposes. The elaborate investigations on wind pressure and the like carried out in aerodynamic laboratories, belong to engineering rather than

to meteorology.

Temperature is a very important factor Temperature as a very important nation.

In ballooning; less important in aviation.

Here, agaik, aerology has gathered a great fund of information. We know not only the normal temperature gradients in the atmosphere, but also under what condi-

tions these gradients are likely to be in-terrupted or rywersed. The typical ver-tical and horizontal distribution of tem-perature in cyclubes and anticyclones— subject concerning which very erromeous opinions formerly prevailed—has now been approximately determined.

Ro with the other meteorological elements. Each of them, thanks to the advent of accology, has now been studied for several years from the three-dimensional point of view, which is the point of view of aeronautics.
Of the special storm warning

for aeronauts recently established or pro-jected we have not space to speak. They are the logical corollary of the science of aeronautical meteorology, and will soon be commonplace institutions the world

## Device for Detecting Flight of Mosquitoes By L. E. Haskell

A N instrument for detecting the direc-tion of flight of adult meaguitoes has been invented by E. F. Quimby and has been put in operation with a great deal of success on the Isthmian Canal Zone. Mr. Quimby, division inspector in the De-partment of Sanitation on the Canal Zone perfected his device for the purpose of ridding the more remote parts of the zone from mosquitoes.

The device consists of a metal fram holding four plates of glass each 12 by 12 inches in size, placed upon a tripod. The angles to one another so that when the inent is set up, they point north, eas



Device for detecting the flight of

south and west. To catch the mosquitoes, a cost of tanglefoot, composed of one half pound of rosin to one liter of castor oil, is prepared, and when applied to the glass to prostically transparent.

Many interesting and important fa regarding the habits of the mosquito have been learned. It was found that the adult mosquito flew on the quarter of an eigh-teen mile an hour wind; that the evening flight occurred between 6:10 and 7:10 o'clock; that there was a complete lull in the flight after 7:10 o'clock; and that there was a return flight between 5:50 and 6:40 o'clock in the morning, also on the wind's quarter.

The instrument has proved to be us ful in locating breeding places by elimin-ating the area facing the plates that do not show a catch. It has established a not show a catch. It has setablished a means of finally exterminating measur-tors on the Canal Zone. The device points out the direction of the breeding places; a thorough search; the discovery or awanny ground or pools of stagnant wa-ter; a little kerosene; and the breeding

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THE RANGE

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Navy to Determine Longitude by Wireless; also Speed of Hertzian Waves

By Louis E. Browne

O'HE of the most important duties of the United States Naval Observatory is is the exchange of time signals with naval hydrographic surveying parties, for estab-lishing the iongitude of points on the coasts of Cuba and Central America, which those parties use as bases of their surveys. Formerly these signals were exchanged by telegraph or crose, out of acc radio-telegraphy has been resorted to for isolated stations without cable connec-tions. This method seems to offer such advantages that the Navy Department is contemplating the abandonment of the belegraph and cable signals.

The Naval Observatory was the first in stitution in the world to have its time sig-nals regularly transmitted by wireless, thus enabling ships at sea to correct their chronometers and thereby more accur-ately to determine their longitude, but the French have become pioneers in the method of exchanging radio signals between shore stations, for the determina-tion of differences of longitude.

In view of the approaching completion of the powerful wireless station at the Eiffel Tower in Paris, the French government inaugurated an international conferment inaugurated at international contents of each of consider questions of regulating radio time signals. The United States was represented by Commander H. H. Hough, the Naval Attaché at Paris, and Prof. A. Hall of the Naval Obervatory.

Recognizing the importance of deter mining the difference of longitude between Washington and some point on the Euro pean continent, in order that it may be used as a base for hydrographic and military survey on this continent and the islands of the Caribbean Sea and the Pacific Ocean, the Navy Department pro-posed that time signals be exchanged by the powerful Arlington wireless station in Washington and the Eiffel Tower station in Paris.

Preliminary investigations are now go ing on, and while an approximate determinution of longitude is expected to result from them, the principal benefit to be derived is the familiarizing of officials of both nations with the methods to be used, to enable them to decide upon a plan of operation for the final tests which will be made this winter. Two instruments, especially designed for the astronomical work, will be of the highest excellence. The very fine meridian circles which are The very fine meridian circles which are installed in the Naval Observatory will be cast aside; for it is desirable that the in-struments used in Washington and Paris should be as nearly identical as science can make them and of such size that they may be interchanged, so that an observer here, after a series of observations lasting several weeks, may take his instrument to Paris and repeat the operation there, the observer in Paris transferring his instrument to Washington. In this way all instrumental and personal errors will be practically eliminated.

As soon as this determination is com-pleted the Washington Government contemplates a determination of the differ-ence of longitude between Washington and ence or iongitude between washington and some point on the Panama Canal Zone and other important points on the Cen-tral Asserican coast. The survey of the Panama Canal Zone, relatively to Europe as well as the United States, grows more and more important as the date for the opening of the canal approaches.

opening of the canal approaches.
Connected with this work, and fully as important to the scientific mind, is the problem of determining the velocity of propagation of the Hertzian waves. Although this phase of wireless telegraphy though this phase of wireless telegraphy has greatly interested scientists the world over, and many theories have been adyrained, so far no frue determination has own, here attempted. It has been conseil, end that the Harristan waves travel, at about the speed of red calcium light, than for whose 188,000 miles per second. At the best date that is only in supportments in lasts, and that the only in supportments in lasts, and that the distribution waves may



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## The Ten Greatest Inventions of Our Time

We hear much of the great inventions of the past—the telegraph, the sewing machine, the telephone, the reaping machine, photography, Bessemer and open hearth steel, the steam engine and the phonograph. Yet the inventions of our own time are as epoch-making and as dramatic as these.

Perhaps because we have become accustomed to the use of the old machines and discoveries, perhaps because the achievements of latter-day inventors succeed one another so rapidly that we are not given much time to marvel at any one of them, we have not fully realized how stirring and wonderful are the products of modern ingenuity.

Only five years ago the man-carrying aeroplane made its first public flights; only the other day hundreds of passengers on a sinking ship were saved with the aid of wireless telegraphy. At least a dozen inventions as great have been perfected in our own time, and all of them have made a man's work count for more than it ever did before, and have made the world more livable than it ever was.

Why should we not tell the story of our own deeds? Why should we not review the industries created by men who are still living, men whose names will go down into history with those of Watt, Morse, McCormick and Howe?

That was the underlying idea of the November Magazine Number of the Scientific American. We knew that the "ten greatest inventions of our time" was a big subject when first we planned the number, but how big it was we never realized until we surveyed the field of modern invention.

Then we saw how astonishing was the progress made in our own day, how much mankind had benefited by the inventions of great modern intellects. We began to appraise inventions, to weigh one against the other, and to determine in our own minds which ten had contributed most to human progress and happiness, which were really great pioneer inventions, and which merely remarkable and valuable improvements on successful past conceptions. There were so many achievements to consider that it was hard to arrive at a definite conclusion.

The upshot of our own thinking has been to leave to our readers the decision

## What Are the Ten Greatest Inventions of Our Time, and Why?

For the Three best articles on the subject, the Scientific American offers in the order of merit, three cash prizes:

First Prize: \$150.00 for the best article Second Prize: \$100.00 for the second best article Third Prize: \$50.00 for the third best article

See page 86—this issue, for conditions of the

travel either 100,000 miles a second faster

or a few theighand nulles allower. The difference of lengthrade of two places will be determined by the difference in time, and this is determined to the observations of so-called clock stars over the meridians of the two places, the greatest care being taken to eliminate all mechanical and personal errors. Everything being ready, star observations will be made to determine the errors in the clock or chromometers to be used at each place. The errors of the two timekeepers being known as the result of these observations, they are then compared by means of wireless signals to determine the difference in time between the two places.

Both clocks will be regulated to best slightly different times; for instance, one will best mean time seconds and the other siderest seconds. This makes the bests of the clocks coincide about every six minutes. If then the clock-leate, in Paris, close the circuit of the wireless apparatus, they will be transmitted through the ether and read in Washington at the Arlington wireless statutos. The observer in Washington will be equipped with a double bend telephone, receiving the radio signals in one sar and the bests of the Washington clock in the other. In this way he can tell when the coincidences occur, and by means of conventions arranged beforehand between the two stations the exact time of the two stations the exact time of the two stations the exact time of the coincidences will be known at each station.

In this way it is expected to determine the difference in time and consequently the difference in longitude to within 1/100 of a second. The siderent second being less than the mean time second by 8/1000, the method of coincidence provides a means of detecting that small fraction of time if one can absolutely tell when the coincidences occur.

conneners over.

The process is then repeated, Arlington sending and the observer at the Effect Tower receiving the beats of the Washington clock as automatically repeated by radio-tolegraphy and beats of the Paris clock in the other ear.

Paris is roughly 3,000 miles from Washington. Vising the estimate that the Hertian waves travel with a velocity equal to that of light, if would take 1/00 of a second for the wireless flash to make its trip across the occun and would take 1/00 of a second for a round trip. A recording apparatus will be set up in Paris which will be capable of revolving at a speed of from 1,000 to 5,000 revolutions | per second. A wireless flash sent by the Paris station will be heard in Washington, and, if possible, will be automatically flashed back again, thus automatically flashed back again, thus automatically resistering on the revolving drum in the Paris observatory. This test will not take place until after the longitude tests have been com-

There is considerable doubt as to whether the method will be practicable, for at present there has been no invention which would permit the "flash back" to the sending station without some degree of personal error.

## The Current Supplement

A N article in this week's SUPPLEMENT AO not be design and use of scientific instruments in acconautics will be found to state fundamental principles of design applicable also in other fields.—A masterly model of Rome at the time of Constantine is illustrated and described.—F. W. Parker writze on "The Spirit of Invention."—John A. Britton contributes an article on Hydro-electric bevelopment in California.—An article by Dr. Gleichen desis with certain defects inherent in California.—An article by Dr. Gleichen desis with certain defects inherent in California.—An article by Dr. Gleichen desis with certain defects inherent in California.—An article by Dr. Gleichen desis with certain defects inherent in California.—An introduction of the study of heredity is a piece to Pred. Z. B. Wilson, in which it is shown how the invention of the prediction of the microscopic stream of the prediction of the pr





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A Marie Comment

NEW YORK, AUGUST 9, 1913

### SCIENTIFIC AMERICAN

NEW YORK, SATURDAY, AUGUST 9, 1913 Published by Munn & Co., Incorporated. Charles Alien Munn Presi Frederick Converse Beach, Secretary and Treasurer all at Mi Broadway, New York

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ling Canada, will be furnished upon application postal or express money order, bank draft or o Munn & Co., Inc., 361 Broadway, New York The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the pholographs are slarp, the articles short, and the facts authentic, the contributions will receive special attention. Accepted articles will be paid for at

The purpose of this fournal is to record accurately. simply, and interestingly, the world's progress in soles tific knowledge and industrial achievement.

#### The Truth About the Iceberg Peril

HAT famous craft, the United States revenue cutter "Seneca," Capt. E. E. Johnson, has added e more to the long list of the valuable se a) ole more to the long list of the validate services which she has rendered to navigation. The "Senseau" it will be remembered was detailed to petrol the fee field during the spring of the present year, looste the position and course of the lesbergs, and make a thorough atroly of this peril and the best means to detect and a vold it. The report of Capt. Johnson shows have well the work was done.

All of the ice seen on or near the Grand Banks this season has been in berg form. The largest berg sighted measured 400 feet long by 300 feet wide and it stood 70 feet high out of the water. All were white in color and no two bore any striking resemblance to each other. The "Seneca" sighted every type and shape of toeberg except the kind popularly pictured in school books, with high, overhanging, craggy pinnacles. The Captain sighted no bergs of the enormous size reported in the newspapers, such as were stated to be half a mile long and 300 feet high. The loftiest berg that he saw was estimated to extend only 150 feet above

The greatest distance at which ice was observed in clear weather by day was eighteen miles. nevent wender by any was eighteen miles. The average beer, on nordinarily clear day, can be sighted from 13 to 16 miles from the ship; on a cloudy day, from 11 to 14 miles. In a slight fog berge can be sighted at 2 miles, in a dense fog at 200 yards, and in drizning rain at 2½ miles. In bright monlight they can be seen at 2½ miles with the raised was in strain. can be seen at 24 miles with the naked eye; in star-light at 1 mile, and at 2 miles distance with glasses. On a night overcast and dark, but with the horizon bergs can be seen at a distance of one half mile with glasses

With a searchlight a berg can be seen at 3 miles on a dimly moonlit night, and at 2 miles after the moon has set; but the observer must stand 15 feet away to one side of the beam if he would see readily. Capt Johnson states that with the beam turned on a berg abreast the ship and 2 miles away, he could see it as plainly as an illuminated store front from the quarterdeck when he was standing about 100 feet from the light. It should be noted that the beam must be drawn to a fine focus, and that a flaring beam blinds the observer. Because of its blinding effect, the Cap the observer. Because of its binning curet, into aspiration would not recommend the general use of the searchight for a vessel under way. Very pertinent is his remark "On a dark night or in thick weather, the vessel in the vicinity of bergs should slow down so as to be able to maneuver within the limits of visibility."

Important, also, is the fact that about ninety per cent of the attempts of the "Seneca" to locate an Iceberg by means of echoes gave no results. The existence of an scho indicates the presence of a berg; its absence proves nothing. Usually an echo will be obtained only found that in a light, low-lying for, the observer could see a berg from aloft sooner than from the deck; on the other hand, in a dense fog it was found that the

lookout was most effective when it was kept from the loucout was most enective when it was super tron ine spar deck, as the first sight of the berg was the ispping of the water at its base. It was noted that the roar of breakers on a berg and the rembing of breaking ice could be heard as far as a malle distant oil a calm

#### Multi-gun Turrets

F the question of how many guns it is best to mount in a single turret were left to the decision of the gun-pointer, the man who elevates and fires the gun, he would unbesitatingly pronounce in favor of one gun for each turret. In a single-gun turret the one gun for each turrer. In a single-gun turrer the gun is mounted directly above the vertical axis of the turret and the shock of discharge does not tend to rotate the turret to right or left and throw the gun off the target. In a two-gun turret, the axis of each gun is several feet from the vertical axis of the turntable on which the turret rotates. Conseq energy of discharge constitutes a powerful moment, tending to rotate the turret—the discharge of the gun to the right of the vertical axis of the turret swinging the gun of the vertices axis of the terret awanging the gun of to the right, and vice verse. It is attempted to resist this tendency by powerful friction clutches; but they are not fully effective and the discharge of me gun is liable to throw its fellow from one to three degrees off the mark. This requires re-sighting and involves delay.

It was the saving of weight both in armor and oper It was the saving or weight both in armor and operating goar that led to placing two guns in a turret; and for many years past this has been the standard practice. It is largely the same consideration that led our navy and those of Italy, Russia and Austria to adopt the three-gun turret. Another compelling motive, which perhaps more than any other is answerable for the introduction of the three-gun turret, is the fact that it simplifies the work of the gun-pointer, by concentrating the splash and enabling him to make a more acnate of the errors in range and traverse Similar considerations have now led the French naval architects and ordinate officers to go one step further and place no less than four guns in a single turrer; and their latest sbips, the "Normandie," "Flanders," "Languedoc," and "Gascogue," are committed to this arrangement. Just how great is the saving of weight due to this concentration may be judged from the fact that these ships are to carry twelve 13.4-inch guns and twenty 5.5-inch guns on a displacement of only 25,000 tons Our own "Pennsylvania," which will mount a tons Our own "Bennsylvania," which will mount a battery of approximately the same weight, rie, twelve 14-inch guns and twenty 5-inch guns, is of over 0,000 tons greater displacement; and although the larger part of this increase is due to the greater size of the ship and the heavier armor, it is certain that the elim-ination of one turret (the "Pennsylvania" carries it main battery in four turrets) with its beavy barbeite, operating gear and other structural weigh count for a considerable amount of the difference.

A serious objection to multi-gun turrets which has A section objection to mutricipu turrets when has been developed at the proving ground tests, has been the fact that the powder blast of the guns tends to throw the shells out of their true path and produces objectionable dispersion. The powder gases, as they burst forth when the base of the shell is clear of the ourst torm when the case of the shell is clear or the music, still carry a pressure that is exceedingly high—between seven and eight tons; and this blast, impinging on the abells of the adjoining guns, somewhat disturbs the accuracy of their flight. The difficulty can tures the accuracy of rear might. The dimensity can be met in two ways: first, by thinking the discharge so that each gun is a small fraction of a second behind the adjoining gun, each shell getting sufficiently clear of the blast of the adjoining gun to be free from inter-ference—a method which is open to the objection of displacement of the turret, attendy referred to above; secondly, by inlacing between the muscles shelded of condly, by placing between the muzzles shields of sufficient strength to oppose the lateral dispersion of the gases until the shells are well clear of the sone of interference. If the weights involved are not prohibitive, this would be the better plan. There can be no doubt that the French navy have given to this problem the most careful investigation and are well satisfied as to its efficiency. But it is a bold step; and the inno-vation will be watched with great interest throughout the navies of the world.

#### Renaissance of the Bicycle

ECENT statistics presented by the Cycle and Automobile Manufacturers' Association of France suggest that some day there may be a renessance of the interest and use of the higyele in this country. According to the reports of the Association for 1912, there were in France at the close of that year S0,155 motor cars, 95,641 motor eyeles, and 2,009, 985 bicycles. With the exception perhaps of those who are directly interested in the bicycle infustry, in this country. Americans will be astonized to higher that in a single country of Europe there are nearly 3,000,000 bicycles in use, and that one person in every thin owns such a machine.

To those of us who sade the t years ago—and who did not opinion that the company of the company ers ago

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maintain a thriving industry, particularly in the image; facturing centers and in such trural emission as any facturing centers and must visit Europa to appreciate the fact that, there, the bicycle has not only held the own, fact that, there, the bicycle has not only held the own, but is increasing in popularity and usertusess. Most surprising will be the degree to which the cycle is used in the very heart of the most populates claim. Strong and serviceable machines, with a complete equipment of multy service on the most crowded shreak, and are used by a wide variety of people in their failty, work. The trademan, delivery boy and messenger, predeminate; one also sees mounted postnen, soldiers and even policemen; not the policemen of a messured estres. policemen; not the policeman of a meaning corps, as we have them in this city, but policemen who are eviwe have them in this cut, our possession was see see dentity using the machine to get to and from their vari-ous bests. Surprising and very interesting are the fear-lessness and skill with which the bisyclist pinnges into the thick of the complicated traffic to European capitals, and accidents seem to be comparatively rars. No doubt this is due in a large measure to the spirit of respect with which the bicyclists are regarded by the beavier forms of traffic. Furthermore, American will be interested to learn that the bicycle is still extensively used in Europe as a means of pleasure. Thousands of people make use of the machine for touring. and so obtain in a chesp, healthy and most enjoyable way, that initmate knowledge of the scenic beauties of the old world which a bicycle tour makes possible. As showing that there has been no such abandonposet of the bicycle in France as has occurred with us, and

that its present popularity is not ephemeral, it may be mentioned that ten years ago there was but one bleycle in France to every thirty persons as against one for every thirteen to-day.

The New Chief of the Weather Burn A FTER an interregum of more than dases among a month, following the summity nearest of the United States Weather Bureau, an admirable accessor has been appointed in the person of Prof. Chartes Prediction that the Arvin. This appointment puts and to a situation that has caused some connormance and to a situation that has caused some connormance. American meteorologists and other persons interested in the future of official meteorology in this country. It the future of official meteorology in this country. It was understood from the outset that this position would be filled on the basis of scientific merit, without refree ence to politics, and that the President had sought the advice of the National Academy of Sciences before undertaking to make a selection; also that fire Academy of Marie and Academy of Sciences before early had appointed a committee which had several names under consideration. However, in contrast to these supplicious arrangements, rumor successively the several present such as the several present whose whose several present when the several present sever immee under consideration. Inverses, is consense to these auspicious arrangements, rumor successively named as the probable appointes several persons whose qualifications for the post were by no means obvious. Apparently meteorological attainments were to be the

apparently meteorological attainments were to be the least influential consideration in filling the most import-ant meteorological post under the Government!

Happily the danger of a mikel apportization has been averted. Prof. Marvin has been connected with the mattonal metacological service for nearly thirty years, having entered the service as a junior professor in 1884. having setered the service as a junior professor in 1884. He is known all over the world as an inventor of metacological apparatus, and has been a roluminous writer on the recipical as well as the practical side of instrumental intelectology. In recent years he has devoted special attention to improving the ensteoregraphs used in connection with kites and ballooiss for exploring the upper air; to perfecting hygowestic apparatus and methods; to the calibration-of amenometers to the measurement of evaporation; and to the improvement of pyrheliometers. Prof. Marvin is a very hard worker—a man of singular modesty and appacational contents of the weather Bureau and the justile if meryes are to be congratulated.

A Bull-digging Machine is a long-fest mant in I land, and the American consent at Americanian with the the General Society for Buth (Deliver, with a quarters at Spanne 71; Hanrison, officer a price of I spanne (10) for the best construction of 100; delivery and the Apricant the war counter of heigh, specific, and points grown in the region between Heighton and points grown in the region between Heighton are composed out of the prisonal width the hand tedious and laborious process. Jan W

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to our constwine trade is shown in the size of the finederested to this service, in the fine character of the
vessels employed and the general excellence of their
edutement and navigation. equipment and navi

Twe Hundred and Pifty Ton Crane for the Panama Canal.—The contract has been let to a German firm, Deutsche Maschinenfabrik A. G. of Duiaburg, for the construction of two large floating arenes of the revolvit type, which are to be capable of lifting 250 tons. The will be used for handling lock parts, and the various heavy loads incident to the work of maintaining and operating the Panama Canal. The poutoon measures 88 feet wide by 150 feet long and the orane can life 20 tons at 22.3 feet from the side of the poutoon; 150 tons at a distance of 62.4 feet, and 100 tons at 31.5 feet beyond the pontoon

The Renaissance of Messina.—It is gratifying to learn that the town of Messina, whose overthrow by earthquake is fresh in our memory, has been so far rebuilt and repopulated as to warrant the construction of a system of electric railways. The two lines, one of which starts from Piassa Pittoria and one from Vills wmon spaces from reasts retorns and one from vital Mastria, will give the city a comprehensive system of transportation with terminals at the railway station and the ferryboats. In addition to the city linas, ex-tensions will be carried well into the adjacent suburbs. The system as now pleaned will have a total length of about 50 miles

Cape Ced Canal by June, 1915.—A year's extension has been granted for the completion of the Cape Cod Canal, which is now due to be opened in June, 1915. This will be the first link in a chain of inland waterways This will be the first link in a chain of inland waterways which it is hoped will ultimately extend from Boston, Mass., to Beaufort, N. C. The route will include Long island Sound, New York Harbor, the Delaware and Raritan Canal, the Chesapsake and Delaware Canal and a system of canals south of Norfolk. A bill is now before Congress which seeks to have the Federal Government purchase the Chesapsake and Delaware Canal and enlarge it sufficiently to meet the needs of construction. se service

Ballway Construction in 1911.—Statistics issued by the Bureau of Railway News and Statistics show that the United States led in the matter of total amount the United States led in the matter of total amount of railroad construction during the year 1911, during which the total amount of new railroade constructed in the world was 17,151 miles, of which 5,260 miles was built in the United States. Europe built 8,100 miles, Phitiah Bast India 2,309 miles, Ariesa 2,222 miles, Argentains 1,800 miles, Australia 804 miles and Canada Gamiles. At the close of 1911 the total railroad milesey of the world was 035,862 miles, and at that time the United States contained 246,000 miles of track, as against: 210,000 miles in Europe.

consequence of tracks.

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All New Enven Locemetives to be Espechested.

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#### Electricity

Maiuring Cheese Electrically.—A British trade paper reports that an electrician of Rotterdam has discovered a method of maturing cheese by electricity. The method consists in subjecting fresh cheese to an alternating current for 24 hours, which treatment results in giving to e all the properties hitherto acquired by aging.

Cost of Lighting Motor Cara,—In order to determine just how much power is used by electric lighting systems of actomobiles, tests were recently conducted at the Indianapolis Motor Speedway. Standard cars were used in the test and they were run as far as possible on a single gallon of gasoline with the electric generating apparatus disconnected. The same car was then run as far as it would go on a gallon of gasoline with the g rating appearatus connected, and the difference in distance traveled showed what proportion of the fuel was consumed in driving the generator. It was found that for higher power cars the fuel consumption for the electric system amounted to 7.3 per cent and for the lower cars 10.77 per cent.

New Method of Sealing Conductors in Glass .- Writing New Method of Sealing Conductors in Glass.—Writing in the Electrical (London) George B. Burnaide describes a new method of hermicially sealing electrical conductors and through glass and other vitroous plass and other vitroous distances. An aperturn is formed in the glass, just large enough to receive the conductor, and after the conductor has been innarted the glass is strongly heated by means of a blow-pipe flame, until perfect consistent has been obtained between the glass and the conductor. The seal is them the conductor of the flames are desait for each of the flames are desaits for each of the flames are desaits for each of the flames are desaits flames and the flames are desaits for each of the flames are desaits flames and the flames are desaits flames and the flames are desaits flames and the flames are desaits flames and the flames are desaits flames and the flames are desaits flames ar of the fiame and when it reaches a dull red heat it is cooled by several immersions in a bath that may consist of by several integerations in a bath that may consist of sperin, or other oil, wax or fat, previously warmed. Each immersion should hast about two or three seconds until the seal is completely cooled. In this way local differences of tempersture are avoided and hence there is no crashing of the giass exound sple conductor. If a large conductor should be used it should preferably be sealed in place in the form of a tube which may subsequently be filled with a conducting substance.

Blectrifying German Railreads.-As a result of tests made on a 15-mile section of the Magdeburg-Halie Railroad, the administrations of Bavaris, Baden and Prussis have decided to use the high-tension single-Prussia have decided to use the high-tension single-phase system, employing also a low frequency. In the test the electric locomotives covered as much as 25,000 miles and showed a very good performance, as that it has now been decided to use the same system in the proposed scheme for the suburbs of Berlin, cover-ing no less than 250 miles of double track and cesting 890,000,000. From another source we learn that elec-tric truction will probably be adopted on the Magde-burg-Leipzig section, which is about 100 miles long, and another extensive provisor palese to the Jackson. and another extensive project relates to the Lauban-Königszelt line in Bilesia, covering 80 miles of direct line and 90 miles of branch roads.

Resistance of Tungsten at High Temperatures. -courate measurements on the electric resistance of Accurate Messagrammers on the electric resistance or tungetes at high temperatures are made by Pirali, and he uses a strip of this metal 2.4 inches long, 0.05 inch wide and 0.002 inch thok, mounted in an exhausted bulb. The strip is soldered to a pair of very fine wires as a support so as to have the heat radiation uniform as a support so as to have the heat radiation uniform, such as in not the case where the filament is attached to the support of an ordinary lamp, for the support carries away heat from the ends of the filament and makes those cooler than the remaindor. He takes the temperature of the tungerien strip by using a Holborn pyrometer, and finds that the ratio of the resistance cont. (taken as unity) is 7 for 1,200 deg. Cent., 10 for 1,000 and 12 for 1,900 deg. Cent.

A Curious Electric Plant is used in connection the old hydraulic plant on the Seme known as the "Mariy machine." The original water wheel and pump plant was put in at the time when Louis XIV built the chateau of Versailles, in order to elevate the water the chalcas of Versailles, in order to elevate the water meeded for the numerour basins and fountains, but it was remodeled in 1856 by the use of more modern water wheels and machines, employing 40-foot under-shot wheels, five in number. But so part of the water had to be used for the city drinking supply of Versailles, the Seins was employed only for power and purer water was pought in a number of large wells much in the vicinity was sought in a number of large wells ann't in the vicinity within recent times. Portable engine groups were installed at the mouth of the various wells in order to raise the water to the uniface previous to sending it to the main pumps. However, within a recent period the engineers found that the Seine Itself could be called upon to furnish the powing for this purpose as well, so that in an adjoining building there were installed not 100 here-power buffuses fed by Seine water, and each tarthine drives a \$5,000-volt alternator. This ourself goes over lines to \$60 hoves-power motors at the well mouths for driving the pumps, so that the steam eagines are only needed or assecondons when freshots in the Seine lower the fixed of water and prevent the numbles from running.

#### Science

A New Honor for Wassermann,-Prof. von Wass mann has been appointed superintendent of the new Kaiser Wilhelm Society for Experimental Therapy at Dahlam, which was founded by the Kaiser Wilhelm society for scientific research

Memerials to Schlaparelli.—A committee comprising the heads of leading Italian scientific institutions and presided over by the King of Italy has been formed to obtain funds by pubble subscription for paying suitable honor to the memory of the late Prof. Guyanni Schin. parelli, the distinguished astronomer. It is to erect a monument to him at his birthpla It is proposed gliano, in Piedmont, and to place a memorial tablet in the Brera Palace at Milan. He was connected with the Deers Phases at Minan. The was connected while the Observatory of Brees for forty years, most of that time as director. To the world at large Schiaparelli was chiefly famous for his discovery of the so-called canals" of Mars in 1877.

The Study of Mountain Snowfall .- Our attention has been called to the fact that a note on "The Economics of Mountain Snowfall," published in our Science Notes column of January 11th, 1913, was somewhat ambiguously worded, with the result that credit appeared to be given to the Weather Bureau for discoveries conhe given to the Weather Bureau for unscovered con-cerning the relation of certain types of forest cover to the conservation of snow on mountains. As a matter of fact, we are not aware that the Weather Bureau lays claim to any such discoveries. The pre-eminent lays claim to any such discoveries. The pre-eminent worker in this field is Prof. J E. Church, Jr. of the University of Nevada, and it was the results attained by him that we summarized in the pertinent portion of our note

A German Observatory in the Far East.—The Impereal Observatory at Tsingtau, capital of the German colony of Kiacchau, China, is rapidly becoming one of the leading scientific institutions of the Far East. the meaning scientific institutions of the rar rest.

Originally founded chiefly for nautical purposes, it now carries on regular work in terrestrial magnetism, seismology, astronomy (including time-service), tidal observations, adjustment of compasses, chronometers, etc., and, above all, practical meteorology. The observatory receives telegraphic weather reports (parily by wireless) from a large number of stations in China, Japan, Korea, and Siberia; also wireless weather : ports from all German war vessels on the Asiatio station Daily weather mans are published forecasts ports from an electron was ressent on the Amatic station Daily weather maps are published, forecasts issued, and storm warnings displayed. When a ty-phoon is reported on the adjacent seas the observatory keeps in constant communication, day and night, by wireless with German men-of-war, and is thus enabled to follow the progress of the disturbance with gree

The Chinese Wood-oil Tree is the subject of a circular by David Fairchild recently published by the U. S. Bureau of Plant Industry, the purpose of the publication being to advocate an extensive cultivation publication being to advocate an extensive cultivation of the tree in this country, where it has been grown in a small way since 1906. The importance of this recommendation is shown by the fact that the millions of wood oil (also known as tung oil), made from the seeds of this plant was imported from China hat year, and the product is said to have had a revolutionary offoot on the variois industry of the United States. It has, asys Mr Farichild, largely taken the place of kauri gum and has made possible the manufacture of a quicker driving variois, wheth is less than the control of the place of t place of Kauri gum and has made possible the manu-facture of a quicker drying varnish, which is less liable to erack than that made from kauri gum, and has been found of special value in waterproof priming for cement. The tree is elimatically adapted for cul-tivation in the Southern States, and the Department Agriculture is distributing one-year-old specimens ona fide experimenters.

Dr. Babcock's Retirement.—Dr Stephen M Babock, for twenty-five years professor of agricultural hemistry at the University of Wisconsin, and the invencasematry at the conversacy or wisconsain, and the inven-tor of the famous milk test which revolutionized dairy methods twelve years ago, has retired from active work with the appointment as Professor Emeritus of the uni-versity. The milk test, which is a method for the ac-ourate determination of fat in milk, is not Dr. Baleccek's only invention. Among his other donations to science are a viscometer for testing the viscosity of oils, a gravimeter for analyzing milk and a method of chloroforming milk to produce a ferment, called galactase, which is used to ripen cheese. As the result of one of his investimilk to produce a terment, called gazactase, when is used to ripen chosee As the result of one of his investigations he discovered that the liquids produced by living plants and saimals are not wholly waste producted but subserve a useful purpose through which, for example, the ascent of sap in trees and the usceulence of fruits is explained. Another of his investigations led to the explained. Another of his investigations led to the deduction that "the weight of a body is an Inverse function of its inherent energy." Declaring that the results of his work belonged to the State which he was serving and not to himself or to any other individual. Dr. Babcock has always refused to take out a patent on any of his inventions. Many of his discoveries have proved of

### Another Contest for the "America's" Cup

#### The Return to Yachts of Moderate Dimensions and Wholesome Type

THE New York Yacht Club has recently announced that the Royal Ulster Yacht Club has signed the conditions for a match for the "Americas" cup, and that the first race will be sailed Thursday, September 10th; the scool, September 12th; the third Reptember 14th; other races which may prove to be necessary to be sailed on each following Thursday, Saturday and Tuesday. Thus this famous trophy, the best known and most valued yachting prize in the labstory of receiving the content of the scool of the New York Yacht Club, is until to be made the object of a memorable contest.

During the past three decades there have been eight series of races for the cup all of which have defending yacht The races were as follows: "Genesta"— "Purltan," 1885; "Galatea"— "Mayflower," 1886; "Thistie"— "Volunteer." 1887 "Valkyrle I l."-"Vigilant." 1893; "Valkyrle III" "Defender." 1805: "Shamrock I."— "Columbia," 1899; "Shamrock 11"— "Columbia," 1901; "Shemrock III." -"Reliance." 1903

In these races the time allow ance which the larger yachta gave determined on the terline length nd sail area Each designer a waterline length not to exceed 90 feet So long as he kept within this length. he was at liberty as broad and as deep as h pleased, and pread above her hull as great an eres of canvas as he thought During these thirpetition, the operatlon of this rule produced a very extreme type of boat, with great beam and length on deck, of ex-treme draught,

treme dramph.

and carrying un enormous sall spread, requiring a very large errow for its handling. The effort to carry the ingrest possible sail spread showed theely both in the form of the hull and the materials for construction of both hull and spars. The extreme form of yacht produced is well illustrated by the 'Reliance,' which, on a waterline length of 80 feet 8 Inches, had an overall length on deck of about 145 feet, a beam of 27 feet, and a draught of about 20 feet. In cross-section, the hull presented the appearance of a shallow well out into the bow and stem section, with a flat floor and hard bliges. The hard bliges were carried well out into the bow and stem sections, with a flat floor and hard bliges. The hard bliges with a flat floor and hard bliges. The hard bliges with a flat floor and hard bliges. The hard bliges with a flat floor and hard bliges. The bard bliges with a flat floor and hard bliges. The bard bliges with a flat show when the special held, she immersed a longer waterline, the original 80 feet new sections, with the result that when the vascel heeled, she immersed a longer waterline, the draming and thin Toblishrance sheets for the platting enabled the designer to reduce the hull welfars and proportionately increase the mass of lead welfars and proportionately increase the mass of lead

at the bottom of the keel. A further increase of the lead ballast was made possible by the substitution of hollow steel masts and spars for those of solid wood. Such construction enabled Herveshoft to place about 85 tons of lead in the keel of the "Reliance" and to spread above her hull the enormous area of 18,247

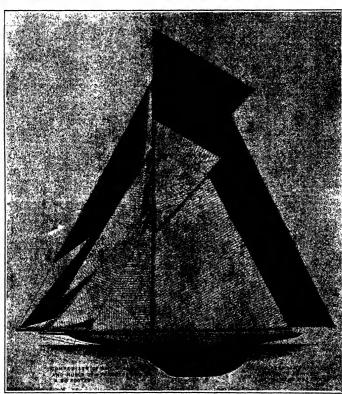
Now such a hilp as the "Reliance" not only costs about \$150,000 to build, but her running expenses are proportionately heavy. She requires a crew of fifty or more men effectively to handle her; she is an uncomfortable boat in a seway; and after a series of ieagth-and-sail-area rule had got in 'its pressistives work of producing freakish beats of somewoods sail area, a boat of 85 to 90 feet waterline carried a sail speeds of from 9,000 to 11,000 equate feet, and such does were reasonable in price and, in cost of management, and were readily handled. When his satispayanted dimensions of the "Reidance" were reached, the cost, and trouble of building and managing these yackts became vary serious indeed. A return to yachts of smaller dimensions, such as contended for the cuty in the seventies and sixties, became desirable. The British chair-lenge sent by Sir Thomas Lipton through the Royal

Ulster Yacht Ch gave the length modern vachi carries a sail area approximately equal to that of the 85 to 90-foot yacht of 20 years before; and she is sufficiently large to provide a thorough test alike of the skill of the designer, the build-er, and the competing skippe and crews. and crews. At cost of construction is cut in balf. of operation Moreover, under yacht is built which after the be cross-bulkbeaded and turned into a fast and thoroughly ser-viceable cruiser.

The accompany superposed drawing of a typical modern 75-foot racing yacht and of the "Reliance" shows at a glance what an all-round reand increase in cured by a reducthe waterline length. As com-"Relience" over-all length on deck is reduced from about 145 to 105 feet, the beam the draught from 20 feet to 18 feet 9 inches, and the

lead that must be molded into the keed to give stability is reduced from 95 to about 37 tons. The main boom is reduced from 115 feet to 84 feet and the height from boom to topmast drops from 135 feet to 111 feet. The cost fails from \$150,000 to \$80,000, and the cost of running the two types is as two to one.

As to the prospects of our retarting the cup in this country. It must be affinited that the reduction in the country. It must be affinited that the reduction in the country. It must be affinited that the reduction in the country. It must be affinited to the country of the cou



The larger yacht is the "Reliance," the last cup defender; the smaller is a typical 75-foot racer.

Comparison of a 75-foot with a 90-foot racing yacht.

races is over, she is useless for ordinary cruising. The fate of a yacht of this character is usually that he is broken up and sold for the value of her media. During the past few years American yacht clubs have dopted a new rule of measurement, which has produced a type of yacht that is practically as fast as the older type, and which has the advantage that her hull is deeper, more commodious and better suited for cruising. The old rule of waterline length and sail area produced a boat of very small displacement in comparison to the great spread of sail—a most undestrable combination. The new rule favors displacement and groduces a boat with a deeper and fuller unsferwater body, and sharp ends, as against the full overhanging ends of the older type.

The contending yachts bulk for the last four periods.

. The contending yachts built for the last four series of races have been of approximately 90-foot waterline length, and in the preceding four series of races the waterline length was about 85 feet. Now before the

#### Some Nevel Electrical Devices By Frenk C. Perkins

Process occasional visits to orange and lemon to be lighted at a moment's notice. Very frequently

to be lighted at a some sections of the ordinard ex-perience a much more decided drop than others on a mt level and hence ther mometers are usent sections of the grove, and it is necessary to have a watch visit them at dif-ferent hours of the night. At best, frost fight ing is not a pleasant job, but to maintain a force of men to meet the emergency, to have them rush out into the cold, dark night filling bαn lighting

smudgepots



Frest alarm for locating danger in fruit orchards.

burning fuel that has cost money, only to find that the

alarm was based on faulty, unreliable information, is an experience to try a man's soul. Recently an electric annunciator system has been devised for use in such situations. Thermometers provided with means for breaking an electric circuit when the mercury col-

for breaking an electric circuit when the mercury column falls below a predetermibed point, are placed in various perts of the orchard and connected to an anmodator in the owner's or keeper's bedroom. If the thermometer falls to the danger point anywhere in the orchard, the alarm bell of the anumentator is rung and the location of the danger spot is indicated on the

ELECTRICALLY LIGHTED INCUBATOR THESE

The difficulty of reading an incubator thermometer in the darkness of the machine is obviated by providing a small electric lamp which lights up the scale of the thermometer, brilliantly illuminating the figures, and show-

ing sharply the end of the mercury column. The device is movable so that it may be adjusted to light up any part of the scale desired. The bettery of the lamp is placed outside of the incubator, and by pressing a

button the thermometer lamp may be lighted. In addition to this there is an electric alarm

bell arranged to give an audible signal when the temperature of the incubator is too low

ELECTRIC FORMING IRON FOR BOOKSINDING.

-Pictured in the accompanying illustration are some electric forming irons for bookbind

ing, which possess the advantage over the

ordinary steam iron of being completely portable. The irons are provided with curved

tops of diameters suitable for the various sizes of books to be formed. The heat is ap-

plied at the top only, so that there is no waste of heat and, of course, none of the an-

CONTRACTOR STATE

#### A New Baseball Indicator By Guy E. Mitchell

WHEN the World's Series is played in October between the two championship teams of the National and American leagues, the fans of the two winning cities as well as in the other cities of the leagues





Electrically lighted incubator thermometer.

the base lines, side, run after fly balls, hold consultations on the field and quarrel with the umpire to hide their own short-comings.

The diamond with seenery is fairly large, and occupies the full depth and width of a theater stage. In the front are shown devices so that the spectators may keep track of the outs, balls, strikes, runs for the inning,

errors, fly halls and in certain plays, whether the runner is out or gafe. On either side is the "box score" luclined to the rear is the diamond proper with two grooves encirching it. In one of these the players move, while in the other the runners move from base to buse.

The manikins that enact the plays are themselves about a foot and a half high, but the working mechanism, which is not seen by the spectators, is just as long. This consists of a dry elec

sits of a dry electric cell from which current is carried to a small half candle-power electric lamy. In the hand of the fluxre-Then through a system of levers the operator is able to raise either right or left arm or both, or cause the fluxre to bend over. In running bases the wheel altached to the manifin fits the lease-runner groce, and in revolving causes the legs to move backward and forward. If the operator whiles to make the fluxre silde into a base it is necessary only to incline the entire device in the direction desired.

Electric cake-making machine of three

Besides an electrician who operates a switchboard from which hits, files, and the devices in front are shown, nine men are required to handle the players. One of these men also announces balls and strikes as

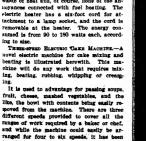
the plays are made. At the commencement of the game he calls "play ball." The nine fielding players in their white suits come up through holes in the diamond and take their respective positions, and the batter in his brown suit comes up through a hole near the home plate and with bat in hand takes up his place A light appears in the pitcher's hand—if he is right-handed, in his right hand, and if left-handed, in his left hand. 'winding un" he delivers the halls toward the batter. The light in his hand is extinguished, and if the pitcher is inclined to be wild it is shown in the catcher's hand. the umpire raises his left arm and the am-nouncer calls "ball one". If the batter makes If the batter makes a safe hit--say for two bases to left field --the progress of the ball is shown on the ground from home plate, between shartstop and third base out into left, where the fielder stoops and the light is shown in his hand. He throws to third base, who in turn relays the ball to the pitcher Possibly the batter was forced to slide into second, but that play is faithfully presented. If, however, the batter merely hit a fly to left field, a light glows over the shortstop's head, then over the head of the left fielder and then in his hund When the side is out, the manikins in white go down through holes and off the field and their places are taken by maniklus in brown, while the batsmen are dressed in white lf. e, a pitcher is being hit very hard and is taken out of the box, that fact is faithfully presented by a consultation be-tween the captain of the tenm and his pitcher and the exit of the latter through a hole near his position in the center of the diamond. If the outgoing pitcher be right handed and his successor left-handed the difference in delivery is faithfully portrayed as is also the usual position occupied by the batters

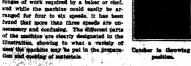
Great entitudence is around among the fans who witness a game on the hourd. Or they see a ministure player representing their playing fold strike out hatter after batter, or the team's slugger lift the hall to all corners of the field with the fielders in pursuit, or mayir the speedy base-namer stealing bases and adding beyond the reach of

will be able to witness every move and every act of the star players through a device which was patented last February by Thomas H. Jackson of Seranton, Pa., and which has been in operation for the past two or three months at Atlantic City, Washington, D. C., Rochester, N. X., and at Mr. Jackson's bome. This 'player' is unlike many of the contrivances heretofore shown, where both players and the bell have been represented by electric lights or colored glass with lights behind them, but is a faitful representation of the game—diamond, grandstand, fences with advertisements on them, the prise winning bull, the scoreboard in center field, and lastly, unpire and players that do everything bull talk. These players throw and catch the ball, run



In the play shown the batter has hit to the second baseman, who threws to third base in order to catch a sliding runner.







Catcher in catching passition.



Skeleton of the man

E C

the basemen with all the realism of the game. Once the operators become expert there is no play made on the dlamond that cannot be reproduced on the device and shown without the need of explanation.

#### A French Cycle Racing-car By S. P. McMinn

THE grotesque-looking little car that appears on our front range this week is the French "Bedsia," that was illustrated and described in the Sacciary of Bedsia and the was illustrated and described in the Scientific American some weeks ago it is of the same sort, but this particular one was developed primarily for speed, and its makers held strong hopes that ill would win the Grand Prix race for cycle-cars, as these little vehicles are styled, which was run off near Ambans on July 12th; but it only succeeded in getting second place despite its elimeter preparation. Notice the narrow tread and the way the driver and his mechanician are seated one lichild the other to reduce wind resistance to the minimum, the disked wheels, and the peculiar meaner

in which the front axie is braced.

Structurally the car is a little bit different from
its predecessors of the same name, and in its makeup there are a number of very luteresting fe The engine, for instance, is a twin-cylinder air-cooled machine with the cylinders set at 90 degrees to each other and a bore and stroke of 82 and 100 millimeters. respectively. The motor is mounted on rails so that it may be moved fore and aft a certain distance in it may be moved rore and art a certain distance in order that the driver may loosen or tighten the belts through which the car is driven; this movement of the engine is controlled by a worm gear operated by the driver. There is no clutch, properly speaking, not is there any countershuft, the drive from the engine being taken directly to the rear wheels through two long belts about twelve feet in length. The driving pulleys are mounted directly on the ends of the engine crankshaft and are of a very unusual type. In the hirger part of them there are small centrifugal govern ors, and as the speed of the car advances, these con irivances draw the cheeks of the driving pulleys to gether slightly, thus increasing the diameter of the driving pulleys and thereby amplifying the genr ratio between the engine and the road wheels. As the speed of the vehicle drops off, the pulleys spread and the gear ratio sutomatically is lowered; thus it is practicully impossible for the operator to "stall" his motor, for gear changes are taken largely out of his hands He can, of course, shift the engine and permit the belts to silp, and in this way obtain a very low goar ratio, but a very inefficient one withal No differential is nsed, quite as a matter of course, for in rounding curves one of the belts slips slightly, thus compensating for the difference in speed of the driving wheels Throughout the whole of the construction the alm of the designer has been to obtain the very lightest weight consistent with strength, and to this end the frame is drilled out wherever possible. Steering is done by means of steel cables wound around a bobbin much after the manner of the typical marine steering gear. Two cables are used, one heavy and one light, and both are passed through fiber tubes where there is any likelihood of chafing. If the heavy cable, which is the one normally in use, should be broken through accident, the lighter one then comes into play, virtu-

#### Millions for Naval Armor—the Remedy By Louis E. Browne

ally, it is nothing more than an emergency rig

A RMOR plate for modern dreadnoughts costs the AT United States one third of the whole amount appropriated for the construction of the vessel. It is the most expensive factor which goes into the make-time of the might phase the state of 10 just three plants in this country. Armor costs the Government \$551 per ton, and the required 10,000 tons needed for one ship or the 20,000 tons needed for one ship or the 20,000 tons needed for one ship or the 20,000 tons needed for one ship of the sound of the state of the ship placed in commission, resulting in an approximate cost to the nation of \$4,540,000 for each ship placed in commission.

placed in commission.

Josephus Duniels, Secreticy of the Navy, has deterulted upon a policy looking to the ultimate establishment of a unval armor plant to a letter to Congress
be said that If Congress authorized a plant large
counsit to produce 10,000 tons per year, or half enough
for a two-battleship programme, the cost of the plant
would be shout \$8,400,000 and the saving in the cost
of armor plate would be about \$140 per ton on the
price of \$450 now paid. Thus, according to his estimates the United States would save \$1,400,000 on 10,000
tons of armor or the carties or or the control or the

tons of armor or the yearly output.

The naval service is divided in opinion as to the advisability of the Government plant Mr. Daniels frankly stated that many problems must be solved before the wisdom of such a plant could be reached, and this at the property operators for the state of the state of the such as the

that at present no accurate figures are available.

Because of the expensive machinery, the Secretary

of the Navy, in a letter to Congress, says that the armor plate industry is susceptible to monopoly. Investigation shows that foreign governments pay their armor plate manufacturers a higher price for armor than does the United States. Three governments in Europe have established national armor plate factories with the result of great saving. They are France, Russia, and Italy. Engiand and Japan are contemplating governmental ulants.

All armor for the Nevy is to-day saids in the Cannegic, Midwise and Rethishem plants at juestically formed to the control of the work is coming to them without reference to the price they bid, have usually submitted bids nearly identical. In the past thay have received one third the work suyway, whether high or low hidders. If one bids much lower than the rest, the other two companies have been awarded their share at the figure of the lowest bidder. The Scertary of the Navy makes these assertions upon the authority of letters received from the Midwale Steal Company and the Betthelmen Steel Company.

Special machinery of extremely costly nature is required to manufacture armor plate more than 1½ inches in thickness. The three named companies are practically the only ones in this country having the

practically the only ones in this country maying the necessary machinery.

Since John Stevens of Hoboken, N. J., proposed armor for war vessels in 1812, the art has advanced to the present high state of perfection.

The object of the modern land-faced super-carboniced armor is a metal homogeneously hardneed as hardness if not harder than, the projectile, and at the same time so tough as not to be shattered by the terrific impact. This armor comprises a series of operations which require the greatest care and attendion to detail, and neatily after receiving the drawings, nine months are required to turn out the finished article. Fourteen operations are received article, the composition of the contracting the low-

Fourteen operations are necessary—custing the low-carbon ingot, stripping the ingot, removing the scale, rough-mechining, carbonizing, scaling, reforging, an osciling, mechining, bending, tempering, rectifying and finish-machlining, and respecting. Tests are required arter forging and tempering. The ingot is placed in a 50-inch double forging press, and willie at red heat subjected to a hydraulic pressure of about 14,000 tons. Then the plate is carbonized. This is an adaptation of the long known process of cementation, which means heating the metal to a high degree of heat in the presence of earbon until the carbon is gradually absorbed into the surface. In bending great care must be exercised, and none but the most skilled artisans operate the huge bending presses, which exert a pressure of 7,000 tons on the plate.

The plate is then heated and sprayed with cold water, at a pressure of 25 pounds to the aquare inch. The plate usually warps and becomes distorted under the plate usually warps and becomes distorted under the treatment, and even under the most akilled it treatment that plates usually have to be rectified. In the Krupp armor characteristic reads, sometimes one quarror armor characteristic reads, sometimes one quarror as inch wide, aspear, but under the Harvey process smoother believes are produced.

smoother joines are produced. It is the final machining and rectifying that cooks so much money. Besides being bored and smoothed, the armor has to be fitted to seach piece which goes into the armor bett and urrets of a ship. It is like a jig-saw puzsit. Little grooves here and there, a notch in one end and an over-lap in the other, and finally the determination of the accurate consiers of the holes for the armor boils, require the constant attention of haif a doesn skilled men for all or eight weeks on each piece

The Secretary of the Navy has faithfully studied the armor problem and is about ready to submit to Congress some definite tiles of the actent of the plant. He holds that with a national armor plant, the Government could determine the accurate cost of armor and then, knowing the oast, require the private concerns canbmit black allowing them a fair profit on the work. Mr. Danfels has submitted a few general facts to Congress regarding the purchase of armor plate by the Government. The actual cost of armor for war vessles of this nation aface its introduction is 187,106,482, of which \$30,844,153 was paid to the Carnegle Steel Company, \$415,151,12 to the Bethishem Steel Company, and \$12,044,217 to the Midwale Steel Company, and \$12,044,217 to the Midwale Steel Company, and since the fairly of the companies for the fairly of the product to foreign autions to foreign autions.

Should Congress authorize the plant, it will be located in Washington near the naval gan factory. Three-separate buildings would be needed to accommodate the special machinery. It is the present fides, if the plant is established and proves a success, to later established and proves a success, to later establish a similar plant of the same capacity on the Pacific coast. This would put the Government in a position to manufacture all of its armore. These, has been a protest against taking the work away from the civilian plants on the grounds that their capacity would be

needed in time of war, bee, 500 Thursday register agr large ing that should the United Status to improve its real no warning could be constructed in fine, so the sit of rice, for the alth could hearth a become under our years, and it is seemed hearth general under our years, and it is seemed hearth generalise for a needed war to last that hearth of these

Ordnance officers in the Warry title small resistant against the Government plant. Spice, should the Navy delegate attraction to the Control of the Control

#### The Electrical Control Boards for the Pamaun Canal Locks

THE great game of the looks at Gattin and Mirraflores of the Parisma Canal will be electrically
operated. The control boards, which have been especially designed and built for this purpose, are now on
their way from Scheueckady to the Canal Zona. In a
future issue of the Scheuertzki Alexancan we hope
tyo an extensive lithustrated description of their construction and operation. Suffect to say for the present, that each board is an electrical counterpart in
miniature of the lock which it controls. By a readingusulous system of lights and scales the operator can
see exactly what is the height of the water in any
particular lock and can watch its gradual stall. The
boards do not control the lock gates directly, but rather
the motors which swing the gates. Readers of the
Schravitz Amazican will recall that the lock chambers
are 1,000 feet long. Many of the vessels which will use
the canal are smaller than this, for which reason provision has been made to divide the chambers into lesser
parts for small vessels. This sub-division is electrically
effected from the control bandes must be operated in a certial order, automatic locking devices having been provided to prevent their operation in any but the correct manner.

#### The Current Supplement

In this week's issue of our SUPPLEASERY Dr. Kons. It is gen expert of Messra. Tiffauly & Company, reports on the new international diamond carst defined nearly defined to the continuous c

#### Bombs Used Against a Mexican Ship

O PRRATING his big biplane under a heavy fire as he circied above the town and buy of Guayana, on July 28th. Didder Masson, a French raistor, dropped several bombs around the Mexican gunboat "Tampico" bring in the harbor, "One of Desse bombs struck within a few feet, of the skip, which probably gere rise to he report that the beat had been sunk. The fact that the aviator operated under fire and escaped deharmed, would seem to emphasize, as has been done neveral coeradous in the past, that the atriably is not to be reckned with lightly as an instrument of warfape.

Making a Tire Pencture-proof.—A pasion, No. LOSS, 558, has issued to Thomas S. Causey, assignor of sine awalk to William Dugan, both of Affinging, Ponas, for a composition of matter consisting of electric, ground alsohots and spasetos, magnesia, giyeren, wood alsohots and water for preventing leaks in passumatic tires. A surplus of the preventing leaks in passumatic tire. A surplus of the improvement of the provided during the rotation of the wheel and as soon at the puncture coours, the art in alternative a specific common forces the material into the papersine, threshing the season of the air.

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#### Laterapondente

the are not responsible for at forrespondence foliation. Anonymic council his considered, but the n is will be cottined when so desire

#### ir Elizan Maxim Asks a Question

To the distor of the Scrawerzo Assumcan:
Asserting to Lowell and some other astronomers,
there was a time when this Held seath of ours was
being boiled at a semprestire of 212 day. Fahr.
Of corres, this is quite true, but it would be at
a time when presidently all of the water was on
the spirit instead of in the atmosphere.
I signed the to sake the opinion of some of the
selection must of America as to what was the
highest temperature during this boiling process,
that is, when the safface of the earth was so very
hot than you water remained on it,

highest's temperature curring the coloning process, that is, when the carriage of the earth was so very hot that very little or no water remained on it, practically all of the water being in aqueous vapors mixed with the atmesphere; then, agaid, it is quite-possible; that the quantity of carbonin said gas—was very great at that time.

Some geologies have told us that about three queriers of the total weight of the earth is made up of timestens. If such be the case, and before any estimate acid gas was absorbed to form limestone or was transformed into coad, there must have been a very heavy pressure on the surface of the earth, perhaps a pressure so great that the first water that remained as liquid would be resting on a red hot curface.

If such he the case, it is very evident that we were being very severely boiled at one time, and at, a still later date the downpour of het rain must have been very great indeed. This state of things must have been very great indeed. This state of things must have continued for many thousands of years.

at, a still later date the downpour of not rain must have been very great indeed. This state of things must have continued for many thousands of year. I should like to hear what the learned men of America have to say on this subject. What was the maximum pressure and what was the maximum temperature during this boiling process? London, Righand.

#### The Evils of Price Cutting

The Evils of Price Cutting

To the Editor of the Scientific Ambarcan:
As we understand it, the object of the Sherman
Anti-trust Law is to prevent combinations in
restraint of trade. Strange to say, this law often
operates to secure directly opposite results. As
manufactures of proprietary remedies and as
wholesale druggists, we labored for years to perfect
and put into execution plans that would secure,
for the manufacturer of proprietary remedies, the
price at which we desired such remedies to be
sold and incidentally thus secure a profit to the
retailer and to the jobber. To accomplish these
unds, it is necessary that the three classes should
work together, that is, the proprietor, the jobber
and the retailer. This was accomplished and astifactory results were secured. The Sherman law
was then invoked and the work that had been

factory results were secured. The Sherman law was then invoked and the work that had been accomplished was decisared to be illegal, and since the issuance of what is called the Indianapolis Decree, each member of each of these classes follows his own particular course of merchandising. The object of the pyricisors, in endeavoring to maintain fixed prices for the jobber and for the retaller, was to secure a profit for these two classes, in order that they would, in the first place, stock his goods, and in the next place, have an interest in increasing their sales. The object of the jobber in assisting this plan was to secure a discount sufficiently large to pay the expenses of handling the goods and getting a small net profit. The sufficiently large to pay the expenses of handling the goods and getting a small net profit. The discounts ranged from 10 and 3 per cent to somewhat more. As the expense of doing business is about 11 per cent, it will be seen that the discount to the Jobber was not excessive. The retailer desired this protection-spo as to enable him to make a sufficient profit on the sales, of proprietary remedies to enable him to easiry time in stock. Another object to be socomplished by the proprietar was that, if a reasonable profit was secured to the retailer, he would not be lumpted to substitute. retailer, he would not be tempted to substitute. The successful enforcement of such protection would result in largely increased sales for projections and reasonable profits for retail distributors. The outcome of the Indianapolis Descene is that the outcers in the largest either have been enabled, because of their largest command of copied, to purchase goods at lowest prices then assignmented druggists and outsidered them. At the present moment, the business of a scale foreign to possibly one of the notice, prospecture of authorized them. As the present moment, the business of a scale foreign to possibly one of the notice, prospecture of the confidence of the confidenc

the sale of proprietary articles, the number of merchants dealing in those articles, in proportion to the population, is decreasing, the business is more and more being concentrated in the hands of large outers in large distributing centers, and the habit of substitution or of selling something "just as good" is necessarily increasing. The operation of the law the law has been, so far as concerns the

of the law has been, so far as concerns the sale of proprietary remedies, to defeat its own ends. In conclusion, it should be borne in mind that he retail price of proprietary medicines is stated on the label, and at no time has any attempt been made to charge the consumers more than the retail price as fixed by proprietors on their own

SMITH, KLINE & FRENCH COMPANY Philadelphia, Pa. HARRY B. FRENCH, President.

#### Fireproof Stairways and Elevators

To the Editor of the Scientific American: The Binghamion factory holocaust is only the logical sequence of a condition for which laws and ordinances

will always be inadequate.

win aways be inadequate.

To eliminate all danger of fire, churches, theaters and
workshops should preferably be one-storied, but never
more than two-storied, and provided, of course, with

the necessary means of egress.

Stair-wells and elevators will always act as funnels and propagate the fire and the smoke, even in the best nd propagate use are and an emotion, which is in the init freproof buildings. I would have, as shown in the secompanying sketch of a floor of a factory workshop,



Firepreof stairways, open to street.

all the halls, the stairs and the elevators entirely out on

The stairs would then be efficient fire-escapes, and the elevator, open on the hall only, with no direct opening whatever on any floor, could be operated and save lives during the fire. This arranger

ent does not take much more room than the present dangerous one, and procludes the necessity E BECKER.

Washington, D. C.

#### Suggestions on Utilizing the Power of the Missouri

To the Editor of the SCIENTIFIC AMERICAN

I notice in the recent issues of your paper that you are discussing the question of more efficiently handling the waters of the Mississippi and Missouri rivers in times of od. Of course, there will be various suggestions as to the best method of performing this class of public work I will suggest to you that I have been doing considerable was suggest to you that I have been doing considerable work on the subject of water-power and conservation of these natural resources. In a recent issue of your paper you make the statement that there are times when the Missour River washes much more sediment into the of the Mississippi River in a single year than the excavations amount to in the Panama Canal. If you were to examine the farms in this western country which surround a part of the Missouri River, you might easily surround a part of the anisoner rever, you make the com-see how a large part of this sediment is washed into the Missouri River. I have lived in a country close to the Missouri River for many years, and have noticed the serosion caused by flood waters, where guilholes and can-yous were washed out desper, and this wash that was your were washed out desper, and this wash that was taken out must have been in part delivered to she Missouri Rivor. I have seen small narrow canyons which were amouth in the bottoms and covered with grass, begin to wash right at the place where they would enter the oresit. This wash would cause a small waterfall, probably hos more than size eight indees in depth, but the continuous wear under heavy rainfall would gradually work hash toward the head of the capture. work back toward the head of the casyon. These guidnes would keep beaking down, and in a few root this wate-full grobably would become sight and ten feet in height. This has been the separiment of the farmers in the Mis-cagait River counter; said sill of this soil which is broken down in this way fland is in why fine the Miscouri and Mis-planding stores. This probably one of the courses, and the greatest course, of selfment washed family into the

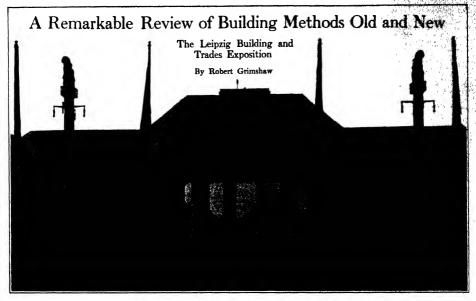
Mississippi River. There is still another source of sediment coming from the Missouri River. This great river ment coming from the Missouri River. This great river in times of flood will break through new banks, and in breaking through wash down a large amount of sediment and replace it upon the opposite bank or wash part of it on down the channel, but this source of washed sediment is not as great as the sediment which originally comes from the farms

Now the question arises as to how best to handle the waters of these great rivers so that the public works will be the least expensive and permanent in their construction. Reading over the comments from various source tion. Reading over the comments from various sources which have been printed in your paper. I have not hith-erto noticed any comments relating to the question or subject of water-power. Permit me to suggest that in improving these rivers for the purpose of carrying away the water in flood times, the question of water-power should not be overlooked. I am informed that the Missouri River is underlain with solid rock This rock is covered with a layer of quicksand and mud If any person cares to study into this subject of water-power, they may soon find that the Missouri River is a much better foundation upon which to build improvements for this class of work. There are reasons for this. First, the banks of the Missouri River are more narrow and higher than the banks of the Misslaslepi. If this question could sussed and the proper investigation be properly discussed and the proper investigations made, I believe that the conclusion would be reached that the proper method of handling these rivers is in connection with the subject of water-power. Dams might be placed across the Missouri River holding the water up from across the same remained water nothing and this would hold back the mad rush of waters at flood periods, and in addi-tion to that, every fall of water that might be obtained would be a source of water-power, and in addition to this water-power these dams might be so constructed that the Missouri River could be made navigable from the mouth of the river as far back as South Dakota. This would give opportunity for the shipment of millions of tons of give opportunity for the shipment of millions of tons of freight from the ocean to the inland states. In addition to those works, these little streams and creeks, which wash out the farmer's fields and carry them down into the rivers, might be stopped by the piscing of small dams where these breaks are found, and thereby prevent this large amount of sediment washing into the Missouri River, If you will take the time to look over that question, you will find that it is not so expensive to handle these rivers in this way as it would be to make great dikes and levees on the Mississippi River by which to carry away the flood waters. Now, in connection with this, I will suggest further to you the National Conservation Conference, which was held four years ago, and which made a report in three volumes, and the same was printed by the order of the United States Senate, showing that the available water-power in the United States amounts to about 230,000,000 water horse-power. If you will consult the United States census reports, you will find that the total amount of horse-power used in our industries throughout the United States amounts to about 18,000,000. now using in the United States in the several industries about one thirteenth of the available water horse-power which we now have and which might be utilized for future generations, if these rivers could be handled in the way that I am now suggesting, and the electric energy deliv-ered and sold to the people of the country at \$20 or \$25 per horse-power per annum. The revenue derived from this source of income would be sufficient to pay all of the taxes of the general Government and of the states and the counties and the schools and all municipalities, and it would be a paying proposition to the Government from the day in which the first water-power could be placed in operation by the methods which I have suggested Other ers do not suggest the utilization of these waters in such a way that they may be a source of profit to the country rather than a source of expense. We are ap-proaching the time in this nation when the question of coal and oil is going to be a serious matter, and these water-powers should be utilized, and an investigation upon this question should be undertaken at an early date for the purpose of finding the real facts as they exist. I wish that you might go over this question, as I have sug-gested these matters to you, and I believe that if this question were placed before Congress in a proper way. appoint a competent commission to give this matter a ost thorough consideration and find the best methods e we spend any money on actual construction.

I believe that the greatest imperfection of the American people lies in the fact that they never apprehend a necessity until they are actually in need. That is our necessity until they are actually in need. That is our condition just at this time in respect to the conservation of our oil fields and the coal fields and these natural resources of water-power. I was before the Legislature this winter in the State of Nobrasks, and undertook to impress that body with the importance of the question of water-power in this State. The question is new and has not been widely discussed, but we must meet the situation in the near future and take this subpact on for has not been widely discussed, but we must meet the situation in the near future and take this subject up for discussion and utilize these water-powers for the conser-vation of our oil and coal.

Walter Joenson. vation of our oil and coal.

University Place, Neb.



Entrance from the Reitzenhainerstrasse through the column portal of the Administration Building.

DEMONSTRATING the intimate relation between science and indus-tity, a characteristic of modern national or international exhibits, the Leipzig Building and Trades Exposition, which opened the inddle of May, to continue until the end of October of this your, is by far the most important attraction of the year in continental Europe, although it is also of world-wide interest. This exhibition follows ideal rather than industrial lines, its

object being to distribute new thoughts, som in 1900 the number of buildings in reinforced concrete showed the progress of French engineers in this line.

The grounds lie southeast of the city proper, and permit ratiway connection for the exhibits right up to the buildings. The greatest width of the exhibition grounds, that from one corner of the amusement part to the main entrance, is 2,624 feet.

Classes of Exhibits.
In the exposition there are eight main classes of exhibits, as follows:

I. The constructive arts: 8 groups, divided into

33 sub-groups. II. Building literature, building-trade

school, office furniture, 3 groups.

III. Building materials, their manufac ture and use; 20 groups, 24 sub-groups.

IV. Machine tools and appliances the building industries: 5 groups, 2 sub-

V. Real estate and transactions in con nection therewith; information and insurance; 5 groups.

VI. Building hygiene for dwellings, factories and streets; protection and welfare of work-people; fire-protection; 6

groups
VII. Gymnastics, games and sports.
VIII. Tests of building materials; expert demonstrations.

The Scientific Department, to which over 50,000 square feet of surface is de-voted, covers four departments as follows: I. Scientific carrying out of construc-

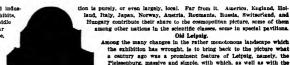
Artistic execution of above-ground constructions and their surroundings.

III. Scientific and artistic execution collective building projects (city building, settlements, colouization).

IV. Hygienical and sociological precau tious in the building trades, etc. (Protection of workmen.)

Many Countries Represented.

It must not be imagined for a moment that although Leipzig is no metropolis of trade or center of diplomacy, the exhibi-



old Rathbaus (City Hall) the history of Leipzig is interwoven.

In his design Drechsler shows not only this old citadel with
its immediate surroundings and the Peter's Gate, but the Grimma Gate and the adjoining University Church and Dominican cloister.

The Machinery Hall.

The Machinery Hall has an area of 55,500 square feet and contains all kinds of machines for making and working building materials; also overhead cranes and other transportation devices. The central light and power station, supplying the entire exhibition grounds with current, is located here; there are two

Diesel motors of 1.120 horse-nower es direct coupled with two dynamos of 750

Statistics in Building Operations.
In order to show the importance of collecting statistics of building operations, there is a special exhibition in this line, there is a special exhibition in him, may, particularly as regards engineering work and political economy. Engineering statistics, especially concerning foundation and overhead building, are well repreand overhead building, are wen repre-sented. Statistics concerning political economy are in charge of specialists. The engineer's hare in the general work of civilisation also comes in for representa-

The City of Leipzig Exhibit.

The city of Leipzig is taking a very active part as exhibitor in the exposition.

There is shown by the municipality a project for the regulation of high water in the western portion of the city; the municipal systems of sewers, gas and water pipes and underground cables; graphical representations of the method graphical representations or the methods of laying out, paving, maintaining and cleaning the streets; the standard systems of design and construction of buildings; and very full graphical representations of the statistical, sanitary and other dements of the municipal government.

THE PROPERTY OF THE PARTY OF TH





Terrace in front of the bridge over October 18th Street. Monument of the "Battle of the Nations" in the background.

collection of models and drawings of engine consection or motess and drawings or engineering con-struction—much more couplete than at previous exhi-bitions. The Saxon State has its own pavilion, and besides this, an installation of safety appliances for railway purposes. Then the governments of Bavaria, Wirttemberg, Hessen and Elsass-Lothringen (Alasca-Lorraine) have special groups. Roumania has its own building.

The Saxon government building fronting on Linden Avenue covers about 10,000 square feet. In this building the state railways and the electric railway com-mission show a full and varied collection of material in their respective lines. Among other exhibits are models, drawings and photographs of new and old bridge constructions, the oldest tunnel in

Germany (at Oberau), many rafiway sta-tions and many noveities in signaling

American Exhibits.

The city of New York is exhibiting models of the East River bridges, and of skyscrapers, models of dwellings of the rich, middle and poorer classes. There is a plan showing the building operations and a large photograph of the city as a and a large photograph of the city as seen from the harbor. A further exhibit is the water supply and the public baths. Mr. Cass Gilbert, the architect, is displaying a model of his 63-story Woolworth build-ing, the model friedf being "Made in Ge-many." Mr. Hornbostel, one of the Carnegle engineers, has also sent a number of interesting models of buildings de-signed by him and erected in New York

Other American municipal exhibits are those of San Francisco, Chicago, Phila-delphia and Washington. The American Bridge Company and the Canadian Rail-way Company also have exhibits.

Art in the Leipzig Exhibition.

The exhibition would be incomplete without a department for pictorial and plastic art; and in order that this may be both full, yet select and representative and worthy, the association of Leipsig artists has a display in two special rooms They exhibit a selection of the pictorial and plastic art of the last thirty years. The importance and character of the ar-hibition may be judged from the mames of some of those whose works are shown: Femerhads, Böcktin, Mennel, Hedler, Leibl, Stuck, Liebermann and Klinger.

It is not to be expected that the head and ounter of the publishing and book-sal-ing interior of Germany, if not of conrmany, if not of con-original interest in this. The technical litera-

nected therewith is strongly represented, but in an en-tirely different and more extended manner from that adopted at previous international and local exhibitions.

adopted at previous international and local exhibitions.

Suscial Agricultural Exhibition.

Eastward from the amusement park comes the special agricultural exhibition, which is of great industrial interest and importance, especially as it shows the various types of structures used for all sorts of agricultural purposes in various countries and districts. In our particular, especially, is it worthy of notice—that of stables; for it has been proved that stable architecture and construction have great influence on the soneral health of the animals, and expecially the general health of the animals, and especially on their powers of resistance to infectious diseases.

View of the Grintma Gate and old La

The Garden City or Garden Suburb "Marienbrunn."
One special feature of the Leipzig exhibition is the farden City or Garden Suburb, the development of which idea is taking place with more or less satisfaction and financial success in various countries and districts.

The present subject is a new and made-to-order "citylet" about a quarter of a mile from the main building of the exposition. It is designed and bullt according to proper sanitary, social, economical, technical and exthe-tic principles. There are seventy-two houses, some for one family, some for more than one, renting for from M. 250 to M. 1,250 (\$59.50 to \$207.50) per year.
The present exposition at Leipzig may be considered

in the light of a response to some of the suggestions brought out at the Dresden Hyglene Exhibition of 1911. Then it was shown how the inhabitants of a town or city are interdependent, while the present exhibit points out how the greatest good to the greatest number may be attained by organized endeavor through municipal and state institutions. A more extended article on the exposition appears in the current issue of the Scientific American

#### Effect of Radium on Plants

Hill seleutist H. Molisch finds that radiam rats have the effect of interrupting the repose of winter buds of different woody plants and thus give rise to a preocious budding. Thus the terminal bu of the Syringa rulgaris when exposed to the effect of strong radium saits are found to develop soon after, and this even during the month of December, when the plant is cultivated in a hot-house. Untreated buds do not unfold, or at most this occurs much later. It is required to determine the time of exposure to the radium very exactly, and should this he too short there is no action produced, while a long exposure is injurious and even mortal. Radium effects are not felt either at the beginning or the end of the repose period. The emanation from radium is also used, and it acts even better than the rays from radium saits, as the effect is more diffused and uniform. When used at the end of November or early in December it will start the buds of Aesculus hippocastanum, Staphila pin-nata and several other plants which were tried. Others like Platanus orientalis, however, give no results. Although the radium salts are too expensive to be used ctice for this purpose, the results are of interest, especially as strong rays from radium do not appear to have the same action upon plants in full growth as they have during the repose period.



Mixing the Danyss virus with grain. Fatal only to rodents.

### The War Against Field Mice in France

By Jacques Boyer

Aremic, barium carbonate, and bisulphile of our bon have been used with more or less success in destroping field mice and sinklar pests. The method now most favored consists in infecting mice with a contagious disease. In the following article the Danyez virus discovered at the Pasteur Institute of Paris and applied for this purpose is described.—Eutron.



Pineing virus-infected grain at the mouths of the

A T the present time France is overrun by field mice and their congeners to such an extrordinary extent that it has heen found necessary to organize an official war of extermination against them. According to information collected by the Ministry of Agriculture the voracious and destructive rodonts have invaded fourteen departments of France (Ain, Alsse, Ardeniues, Aube. Belfort, Cole d'Or. Doubs, Haute-Marne, Jura, Muerthe-et-Mossele, Menus, Suvole, Haute Savole, Vosges). They attack all crops, devouring clover, uncerea and sandrion as well as pring grain, bests and Jerusalem artichokes, and do not expare even the bude of isolated vineards and support for the rest.

The most destructive of the rodenis are the field rut (Arteloia gorestic) and the field must (Arteloia gorestic) and the field must (Arteloia gorestic) and the field must (Mus spitesticus) At irregular intervals, as in the pre-sent year, these peets appear suddenly in immones numbers, in midsummer, and vanish as mysteriously, but not with out leaving insurantial transmission of titler vialt. These formidable little animals have cost French farmers autoid millium Since

formidable little animals have cost French farmers mitted milliams Since the commencement of the nineteenth contury they have made at least a dozen serious incurdons, the most disastrous of which extended from the summer of 1801 through the autumn of 1802. In three departments the crops were annihilated and the meadows completely rulned.

A commission appointed by the Academied eas Neiences to dethis means of combating the securge outlinated the loss smentured by the single department of La Vendée at more than half a million dol lars. In 1822 the rodents increased predictionally in Alsace and more than two millions of them were killed in two weeks of the vigorous warfare waged against them. Many similar examples might be cited. The average annual loss caused by those field peats in France is estimated at forty million dollars.

In order to discover rational methods of combating these destructive sulmals it is necessary to uscertain the causes that give rise, intermittently, to their immen and often widely disseminated hord Formerly it was believed that the rodents were migratory, for in many instances few of them are seen in the year preceding a great invasion, and still fewer the year after the invasion. But the obervations of Crampe, Ritzoma Bos, and J. Danysz have made it certain that the members of even the densest swarm begin life very near the scene of their depredations. They may invade adjoining fields when they have exhausted the resources of their hirthpines, but they never emi-grate in great numbers. The intensity and suddenness of their visitations must be attributed to the extraordinary fecundity of these animals, which is increased by the numerical preponderance of females. Danysz has calculated that one pair of adults may produce, between February and the end of autumn, a progeny of 200 females and 100 males. Hence n rodent population of 150 (an almost inappreciable number) existing in a hectare of land (about 2½ acres) in February, may increase to 10,000 in July and to 20,000 in September by their normal multiplication

Portunately, the animals born in late summer and autumn do not attain their full development until winter, and most of them prelish in the first severely cold weather. On the other hand, young litters and prejmant females are killed by late spring frosts, following several days of mild dry weather. The rodests are not continually hunted and destroyed by Dirds of prey and by moles, shrew-moles, hedgehogs and other antimals

Finally, when these various destructive agencies fail, the rodents perish in consequence of their own enormus increase. If they are too numerous in any place, they become weakened by lack of food and fall an easy prey to feas, ticks and fungus parsaits, which produce fatal epidemics in the active and voraclous best.

These assertions are corroborated and a new light



Field-monee (Mus sylvatious).



Field-rat (Arvicele agreetie).



The shrow mele, which destroys other codents.

In throws on the habits of these animals by the investigation, recently completed by MM. Georrapain, and Demoion, of their size in the control of the thickness of the control of the control of the thickness of the control of the control of the thickness of the control of the the destruction of every focus of invasion, as soon as it is discovered.

Effective methods of destroying the formidable rodents have long been sought. At first, poisoning with arsenic was recommended. A mixture of areatic and four is stirred into a quantity of wheat moistened with molasses, and the poisoned grain is placed in drain tilles of small caliber which are distributed through the lifested fields. Some writers advise placing the poisoned grain in the rodents burrows

poisoned grain in the rodenta' burrows and stopping the outrances with earth. This method yields imperfect and uncertain results, for the rodents often refue to eat the poisoned grain, which they scatter around their holes, where it may be eaten by ponitry and game birds. Arsenic, moreover, is intensely poisonous to all animals and to human beings.

It is better, therefore, to use the barium carbonate bread invested by Dr. Hitner of Munich. Four parts of chesp flour and one part of barium carbonate are mixed with water and yeast. The dought is allowed to rise and is based in compact hard loaves about 1½ inches thick. The bread is soaked in satismed milk or spitchied with essence of sinseed and is broken into pieces as big as a heasing, one or two of which are put into each burrow. It is asserted that little more than one pound of bread to the arre in required to rid a field of rodent pests, so that this method is both cheep and

In Denmark, in 1910, a method of destroying field mice with biardphide of carbon was introduced by E. de Kruyff. All orifices of the Burrows are stepped at might, and on the following night one or two cubig continuences: (thimbierhie) of bianishible, of chrobn are poured into each new opening that the mine have made. After waiting a few seconds to allow the liquid to evaporate a lighted tooch is applied to the hole. The beautiphide experiments and explodes, filling the burrow with polasmost gases, which instantly, this its demiseas. One pound of biantphide is carbon is enough for more than 900 herrows. Although this method is viery effective it is also output for more than 900 herrows. Although this method is viery effective it is also never of electric said dangeous when applied by carpless or inseparelected persons, because of this gapit inflatmantability of the bisusphide representation of the control of

and the state of the



The heat was so intense, it was necessary to open the dears with large iron rods.

### Fire, Load and Water Test of Floor Arches

An Interesting Test in Which the Qualities of Gypsum, Terra Cotta Tile, and Reinforced Concrete Were Tested for Several Hours in Fierce Heat



Huge concrete firebox in which heat was kept at 1,700 deg. Fahr, for four hours.

A N interesting and conclusive demonstration of the A fire resisting qualities of various building materials used in Store crebs, was made on Wednesday of last week by Mr. Harold Perzine of Columbia University, at his testing station in Greenjouta, Long laisald. There were three arches built especially for this test. One of these was built up of 4 these of reinforced gypsum and sharings with a 2-inch cinder fill, another consisted of 50-inch holious term count tile with a 4-inch cinder fill, while the third arch was a 4-inch reinforced cinder concerte also with a 2-inch cinder fill. In each case the cinder fill consisted of one part cement and na parts cinders, while he concerts was composed of one part cement, two parts and and five parts cinders. The reinforcing material in the grpeum and converted material in the grpeum and converted materials in the grapeum and converted with a 4 to the first converted was contracted with a 4 to the first converted was converted to the grapeum and converted the grapeum and g

The arches were each 5 feet 3 inches wide between the center lines of the beams, and 14 feet long, consitueted over a 14 by 20-foot concrete drabox in such a manner that the under sides of the arches were directly exposed to the fames. In the walls of the firebox were six flues, three ou each side, in order to provide a proper draft.

At 11 A. M. a hot fire was built on the grate and

At 11 A. M. a bot free was built on the grate and neveral workness were kept buy piling in cord wood to keep the temperature up to 1,700 deg. Fahr. This temperature was recorded and maintained by the use of electric pyrometers, fron tubes being placed at various points in the roof or arches for this purpose. This was continued for four hours, readings being taken frequently by means of a surveyor's level, located on a nearby roof, for the purpose of assortaining the deficetion in the arches due to the intense heat.

It should be added that the arches were constructed in strict accordance with the requirements of the building department of New York city, and even the allowable load, to which stoors are restricted, was added. This was done by pilling rist from on top of the arches, as is clearly shown in the illustrations, until the load reached 150 bounds per square foot. There were no partitions inside the firebox and each arch was subjected to the same amount of beat during the entire four hours of the test.

At the end of the four hours a division of the city

At the end of the four hours a division of the city for department was on hand to extinguish the fire and cool the walls and arches. The firement turned a stream of tremendous force against the hot firebox and finor arches and made short work of the fire. There was a water pressure of 60 pounds per square inch from a Uki-the hours!

It was a surprise to many who witnessed the performance that the arches stood up as well as they did, considering the high temperatures and very sudden confidering the high temperatures and very sudden collag to which they had been subjected. The term stood the collection of the collection of the collection to the collection of the but the arch did not give vary, as was predicted by servval of the witnesses after the test had been running two hours. It was also noted that this arch had defacted one inch from the level, while the others were undisturbed.

The gypsum arch was intest above the reinforcing stool, although it had crumbind away below this. Considering the nature of this material, and also that it was mixed with wood shavings, it stood up remarkably well, even with the 150 pounds per square foot of lead. As was expected, the concrete arch showed no great effect from the ordeal to which it had been subjected. It had not even crumbied away from the reinforcing steel, and had showed no appreciable defection.

by the fact that it was attended by more than a hun-

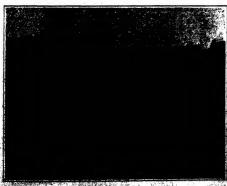
dred men, including engineers, architects, contractors, and dealers in fire-proofing and reinforcing materials, as well as several representatives of engineering and scientific publications.

#### Gasoline Substitutes

LEWEN in the Chemical World, 2,113, predicts that the waning supply of gasoline will very soon force the use of alcohol densurated with ten per cear of benzol. This will be safer, more pleasant to use and sweeter in exhaust than the gasoline of to-day. Though the caloride value of this mixture is only six touths that of 'perrol' or gasoline, the higher compression possible and increased explosive range will make it the ideal motor spirit. Benzol itself is being seriously considered as a substitute. It is twolve per cent more powerful in running than passoline and Binglish coke over plants yield 8,000,000 gallone as a by-product. The cummer-call product contribing, as it does, 150 grains of sulphur per gallon needs cureful purification for motor use.

#### Sugar as a Surgical Antiseptic

IT has long been known that sugar was a disinfecting and preservative spent. The fact is even said to have been mentioned by Galen. But it is rather novel to learn from Lo Revue that an eminent German surgeon, Dr. Georg Magnus of Munch, who is famous as a traumatologist, recommends it strongly as a dressing for wounds. All saccharine substances are good, but pure cane sugar or heel sugar is best. Its disinfecting and sterilising qualities are excellent. It is not injurious to the blood, as has been wrongly believed, and is a better preventive of putrefaction and contamination by microbes than ordinary modical antiserdies.



A weight of 194 persons per equals



After the four-hour test fremen were called to extinguish the flames and to

#### Technical Schools

READER'S RERVICE—Hardly a west passe but the Editor receives lotters from resident of the search of the search of the search of the search the boys to a technical school. Whethere a bo shall become an engineer, a chemist or a mayal servi-tor are questional that putsel persunts. The Editor wit not are constructed that putsel persunts. The Editor wit in identifying the matter of sechnical schools for their some Address. Educational Surgeau.

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#### The Industrial Need of Technically Trained Men-VI A Study of Incomes of Technically Trained Mon

By David Edgar Rice, Ph.D., Secretary School of Science and Techn Pratt Institute

ie income is naturally a factor of considerable importance. This factor is very often veiled under the more general term "opportunity," but opportunity means simply the active demand for the service offered, and where labor is concerned, this

the wage. Educational institutions that offer a variety of courses of training are frequently called upon by prospective students to give some statement as to the ing? Is the mining engineer more likely to secure profitable employment than the

se and similar questions may be co sidered from a theoretical point of view. but as the proof of the pudding is in the eating, so the most direct and convincing answer to such questions is to be derived from a study of relative incomes, where curate information is available.

The School of Science and Tech of Pratt Institute, Brooklyn, N Y., has ently completed an investigation of this character. The data have been gathered from more than one thousand men who, within the past nineteen years, have comcourses are two years in length and cover the fields of mechanics, electricity and chemistry. They do not profess to be engineering courses, but are rather of the so-called "industrial" type, offering technical and practical training intended to prepare young men for positions of re-sponsibility above the grade of skilled mechanic in mechanical, electrical and chemical manufacturing and industrial

The men enter these courses at an average age of from eighteen to nineteen years. Some of them have had three or four years of a high school course, but little or no practical experience. Many of them, on the other hand, have had a considerable amount of practical experience, but are without the preparation af-forded by a secondary course of study. The data here presented, therefore, in-

dicate the earning power, which may, on the average, reasonably he expected by intelligent, capable young men in these in-dustries who have taken two years to train themselves technically for the positions of more importance and responsibility than those of skilled mechanics.

The information was collected directly

from the graduates themselves. Each graduate was asked to state his innot in exact figures, but by means of code letters covering a fixed salary range. Be-low \$1,500 each salary group had a range of \$250. Above \$1,500 the range was \$500. edian of the range of each group was taken as the actual figure in making up the average. To this extent the figures here given lack absolute accuracy. The error possibly resulting from this cause was to some extent offset by plotting the average incomes of the different classes in graphic form, drawing a smooth curve gh the several points, and taking off the averages from these curves.

The tables herewith given show the average incomes of the graduates of the several courses for each year after graduation, the average incomes of the 20 per cent of each class having the highest incomes, and the average of the 20 per cent having the lowest incomes. For the mehaving the lowest incomes. For the me-chanical course, the so-called course in steam and machine design, the period since graduation ranges from half a year to eighteen and a half years. For the course in applied electricity the maxi-mum period since graduation is fourteen

N the choice of a vocation, the prob- are comparatively small in number, and that the returns from these classes also are less complete. The data for these classes are therefore somewhat less re liable, representing averages made up from the experiences of comparatively few individuals. For classes that have been out more than ten years, the number of men represented is less than twenty

For classes out less than ten years the er ranges from twenty to forty-five. Table I gives the facts for the grad quentry caused upon by prospective sub-dents to give some statement as to the relative opportunities in different lines of design, the oldest course in steam and machine work. Loss electrical engineering offer a broader field than mechanical engineer class. It shows that at six months after class. If shows that at the labels and graduation, when practically all members of the class may be presumed to be fairly well settled in their positions, the average ne is approximately \$875. For period of about ten years after graduation the annual rate of increase is practically uniform, and is, on the average, abou \$140. At this point it becomes noticeably less, being reduced to an average of ap proximately \$100. It is, however, interes ing to note that even to the last there i a constant increase in the annual income indicating that the men who have been out in practical work for more than eighteen years since their graduation have not yet begun to reach a limit to their earning capacity—a very strong argument in support of the advantages of tech

> The second and third columns give the average incomes, respectively, of the higher fifth and lower fifth of the severa classes. They serve merely to show the salary range and call for no special com-

nical training.

for graduates of the course in applied electricity. The average income for the entire class is practically the same as fo the graduates of the mechanical course except that the initial income is slightly This difference, however, disappear

within the first two years.

A comparison of the figures for the upnd lower fifths of the clas that the range for the electrical course is siderably less than for the mechanical While the incomes of the more successfu electrical men do not run so high as thos of the more successful mechanical men, the averages for the less successful, on the other hand, do not reach so low a

A comparison of the average inc for these two courses is interesting in connection with the question as to which field the mechanical or the electrical, offers the better opportunities for advance The prevailing impression, at least am young men who find it necessary to make a choice, seems to be in favor of the elec-trical field, but the facts here presented

do not support this view.

Table III summarizes the facts for the course in applied chemistry. This is the most recently established course in the school, and had only six classes of gradnates at the time this information was gathered. The striking fact in connection with this table is the rapid rise of the average salary in comparison with that of the other two courses. Although the initial income is practically the same for all three courses, the chemistry graduates reach the \$1,500 point almost two years earlier than do the graduates of the other courses, and they reach the \$1,900 mans nimost three years earlier. In explanation of the better showing

made by the chemistry graduates, several factors are to be considered. In the first place it seems to be the fact that the training in industrial chemistry can be to eighteen and a haif years. For the results of the state of the stat

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sort of preliminary apprenticeship is necessary before they can develop a high degree of efficiency

In the next place it is undoubtedly true In the next place it is undoubtedly true that the supply of men trained for work in industrial chemistry is considerably less than in the mechanical and electrical fields. It is only recently that the possi-bilities of the industrial chemistry field have begun to be resilized Comparatively few institutions offer courses in chemical engineering and comparatively few men graduate from these courses

Another factor to be considered is that

in the chemical fields the transition from the status of employee to that of em ployer or proprietor is probably easier The business of manufacturing chemiss on a small scale may be established with much less capital than is usually required for enterprises of similar character in me

In comparing the facts given in these tables with corresponding data from other institutions, it should be borne in mind as has already been pointed out the these are not engineering courses but two year courses of practical character intend ed to give the essentials of a tecl education to men who have had but little are compelled by circumstances to work their way upward from the ranks

	TABLE		
Average annual	incom a fe		ical me
Period after	Average	Highest	Lowe
Cireduation	of class	Afth	fifth
Six months	875	1 250	70
One year	940	1 875	714
Two years	1 075	1 576	754
Three	1 225	1 810	85
Four	1 875	2 050	92
Five	1 500	2 300	97
Six	1 650	2,500	1 010
Beven	1 775	2 759	1 07
Right	1 925	2 000	1 15
Nine	2 075	3,200	1 22
Ten	2 245	8 425	1 27
Eleven	2 325	8 650	1 32
Tweive	2 425	3,825	1 37
Phirteen	2 525	4 000	1 42
Fourteen	2 625	4 150	1 500
Fiftout	2 725	4 275	1 570
Rixteen	2 825	4 475	1 62
Heventeen	2 900	4 580	1 67
Righteen	3 000	4 675	1 754

magnition	3 000	4 010	1 100
	TABLE	11	
Average annual	Incomes	for electric	cai men
Period after	Average	Highest	Lower
Graduation	of class	Afth	fifth
Six months	840	1 185	675
One year	800	1 325	690
Two years	1 075	1 500	750
Three	1 225	1 750	820
Four	1 375	1 950	925
Five	1 500	2 150	1 000
Six	1 650	2 875	1 100
Boven	1 775	2 575	1 150
Fight	1 025	2 775	1 250
Nipc	2 075	2 975	1 325
Ten	2 200	3 200	1 400
Ekven	2 800	3 375	1 450
1 weir	2 485	3,525	1 478
Thirtee o	2,450	8 700	1 590
Fourteen	2 500	J 825	1 550

fourteen	2 500	3 825	1 550
	TABI E I	11	
Average annual	incomes	for chemical	men
Period after	Average	Highest	Lowes
Graduation	of class.	fifth	Actb
tx months	675	1 075	675
ne year	930	1 830	727
'wo years	1 215	1 815	815
Chree	1 440	2 275	940
Tour	1 675	2 750	1 075
Tive	1 900	8 200	1 175

#### Neglected Subjects in Medicine

A NYONE who turns the pages of the huge Index Catalogue of the Library of the Surgeon General's Office United States Army, of which 23 volumes have been published up to date and which is seen paintains up to date and when as a practically exhaustive catalogue not only of medical books, but of articles in the medical journals of all countries, might gather the impression that greey medical topic of the alightest importance

madical topic of the slightest importance had been fully investigated and writton up. This is, however by no means the case, for many such topics of very con-address to the considerable importance have been almost completely neglected. We recently called attention in these columns to the fact that hardly anything is known about the six ture and causes of "astraphobia," i. a., the pathological effects experiessed by many persons before and during thunder-sions. An analogous cans be that of "assisrophobia," or mortisi antipathy to



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# The Ten Greatest **Inventions of Our Time**

We hear much of the great inventions of the pastthe telegraph, the sewing machine, the telephone, the reaping machine, photography, Bessemer and open hearth steel, the steam engine and the phonograph. Yet the inventions of our own time are as epoch-making and as dramatic as these.

Perhaps because we have become accustomed to the use of the old machines and discoveries, perhaps because the achievements of latter-day inventors succeed one another so rapidly that we are not given much time to marvel at any one of them, we have not fully realized how stirring and wonderful are the products of modern ingenuity.

Only five years ago the man-carrying aeroplane made its first public flights; only the other day hundreds of passengers on a sinking ship were saved with the aid of wireless telegraphy. At least a dozen inventions as great have been perfected in our own time, and all of them have made a man's work count for more than it ever did before, and have made the world more livable than it ever was.

Why should we not tell the story of our own deeds? Why should we not review the industries created by men who are still living, men whose names will go down into history with those of Watt, Morse, McCormick and Howe?

That was the underlying idea of the November Magazine Number of the Scientific American. We knew that the "ten greatest inventions of our time" was a big subject when first we planned the number, but how big it was we never realized until we surveyed the field of modern invention.

Then we saw how astonishing was the progress made in our own day, how much mankind had benefited by the inventions of great modern intellects. We began to appraise inventions, to weigh one against the other, and to determine in our own minds which ten had contributed most to human progress and happiness, which were really great pioneer inventions, and which merely remarkable and valuable improvements on successful past conceptions. There were so many achievements to consider that it was hard to arrive at a definite conclusion.

The upshot of our own thinking has been to leave to our readers the decision

### What Are the Ten Greatest Inventions of Our Time. and Why?

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ests. What little is knows, scie on this subject is almost entirely due to Dr. Weir Mitchell, and his rather fragcomparatively recent; whereas the ci tion in question, like that connected was thunderstorms, is neither novel nor un familiar in its non-eclentific aspects; profamiliar in its non-scientific aspects; prop-ubly there are few readers of this journal who do not number several "seture phobes" among their acquaintances. How does it happen that there is not an exten other subject that has been greatly ne glected is dermatitis venenata, especially in connection with plants. Dr. 3. O. White's book on this subject, published is 1887 and now out of print, is the unique ographic treatment of the questi How many people, even in the medica profession, realize that upward of 60 com on species of plants growing in the United States are more or less poisonou to the touch? The attention of the publi in this connection, has been strangel opolised by poison ivy and its ec

#### Field Mice

(Concluded from page 114.) bisulphide vapor kills most of the mice and the destruction is completed by reand the destruction is completed by resulting the application, on the following night, to the few holes that are again found open. This process may require right or ulue pounds of bisulphide per acre. The suffocation of the rodents by sg their burrows with sulphurous acid and other gases requires the use of cum

The method of destroying rodent field ests which is now most favored consists infection with a contact of in infection with a contagious dis In Germany the Loeffler virus is used. In France, the Danysz virus has been adopt ed after many experiments. The Danyss virus, which is nearly related to Lossi is prepared at the Pasteur Institute an siso by departmental veterinaries. Its Typhimurium), which Danyss found in the bodies of field-rats, in 1893.

Experiments continued through several years have led Danysz to recommend the following method of employing it: The virus, diluted with sait solution with rolled oats or crushed wheat or barley and allowed to ferment for three or four hours. A small quantity of the mix the burrows The virus is supplied in litthe bottles, each of which, with 22 pounds of grain, ½ ounce of sait and 7 pints of water, suffices for the treatment of one of water, sunness for the treatment of one hectare (2½ acres). The period of incubation of the disease is ten days, and the mortality is 85 to 95 per cent if fresh virus has been used. Virus more than four days old, on the contrary, n fails to kill the rodents, but it "fattens" them, as the farmers say. Denon has proposed to assist the action of the virus by adding barlum carbonate to the i ed grain, but this proceeding has not bee of the Danyez virus alone has received both popular and official sanction in France, and also in Tunis, Hamburg,

Copenhagen, and elsewhere.

The virus can be obtained with culty from the Pasteur Institute, wh special laboratory, which can furnish ch can furnish sev eral thousand bettles of virus per day, has been established. The French railway companies have agreed to forward the virus by fast trains at a very low tariff. The cost of treatment, therefore, does not rue cost of treatment her never does not exceed fifty cents per sere. This method, which is the only one recommended in the intest circular of the Ministry of Agriculincest circular of the animatry of Agricul-ture, possesses the great advantage over all others that the grain infacted with Danysz virus is harmless to domestic ani-mals, birds and the men who distribute it.

male, birds and the men who distribute it. If satisfactory results are not destanded in two weeks, however, Guerranain, and Demolou advise the employment of arsenic, and if this size falls, the use of blutphide of earton, two weeks laker, by treatment, by successive somes, including hodges, groves and coker further states.











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Broax, New York, N. Y. This invention prorides a newas for preventing the burning of
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to the support and holding end thereof. The
unconsumed portion of the wick is hold sus
passed and prevented from following its metird wat below the holding perition of the support. Messas assepted the englishiry action of
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Machines and Machanical Bovices.

MRGHETE GAGE FOR PRINTING THE APPRICACE. AL The invention more particularly relates to means for automatically registering the paper or crade to be printed, whereby the work is improved in appearance and the output possible over printing apparatum not equipped in materially increased, it being possible to operate the press at a much failter and better the press at a much failter and the work.

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Railways and Their Accessories.

DEVICE FOR AUTOMATICALIN '(LOS1106 LOCOMOTIVE VALVES.—T. W. Garries, V. Byfraghold, Mo., and C. J. RAYRES, 211 S.

Oak St., Sapuips, Okta. The invention relates to raired fittings of a locomotive, and more particularly to those fittings, including valves which are normally open and which communication with partial likely to be broken as the retain being to profide corrections by which the certain valves may be automatically closed simultaneously with the application of the certain valves may be automatically closed simultaneously with the application of the emergency air brake.

Nora.—Copies of any of these patents with be furnished by the Scientific American for tan cents each. Please state the name of the patentee, title of the invention, and date of this paper.

this paper.

We wish to call attention to the fact that we are in a position to treader competent active are in a position to treader competent active that the competent active the competent active the competent active the competent active the competent throughly furnised to prepare and prosecute all patent applications, rerespective at the complex nature of the subject matter invalved, or of the specialized, benchmark or extendible throughout the cuttient active from the competent active throughout the competent active from an one association throughout the competent and trade-mark applications and in all your cities freedge to the United States.

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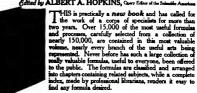
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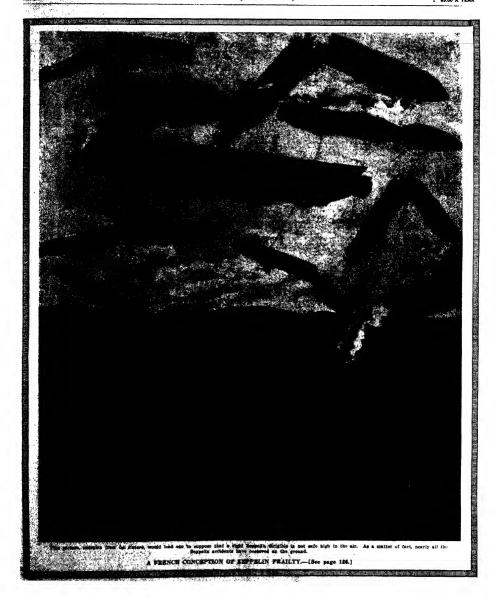
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ditor is always gial to receive for examination illustrated as or subjects of timely interest. If the piotographs are surprictles what, and the facts cuthentic, the contributions will a special attention. Accepted articles will be paid for at space rates.

The purpose of this journal is to record accurately, simply, and interestingly, the world's progress in scientific knowledge and industrial achievement.

#### Sea-level Canal Fallacies

HE rupid increase which is taking place in th dimensions of the largest steamships built for the Atlantic trade—the fact that vessels exceeding 900 feet in length are now either actively engaged in service, or are approaching completion by the build-ers, has led to a revival in the public press of the arguers, ms ted to a revival in the pulsor press of the argu-ments which were used several years ago in favor of building a sea-level cauni at l'anama. Attention is drawn to the fact that since the "imperator" is 680 feet in length over all, and the "Vaterland," which will visit this port next spring, will be 940 feet in length, and a third vessel, now on the stocks, will be even longer, the time is approaching when the usuble length of 1,000 feet of the locks of Panama will be found i ficient to accommodate the largest ships of the mer-

Would it not have been wiser, say the critics, to inve built the Panama Canal at sea level and thus have pro-vided a channel, free from obstruction, through which the world's shipping could pass at any time without let

Now the pros and cons of this problem were very Now the prox and cons or this problem were very thoroughly entered into by the Isthmian Canul Com-mission when it was preparing data for the guidance of Congress in reaching a decision as to whether the canal should be built with locks or at sea level. So far as the professional mind is concerned, we doubt if any engineer could be found to-day who would advocate the construction of a sea-level canal at Panama; but since the question has been raised and agitated in the lay press, we will re-state, briefly, the conditions which render a canal at sea level both technically and commercially impossible.

In the first place, then, let it be clearly understood that any kind of a canal at Panama must perforce be provided with locks; and this for the reason that the great difference in level of the Atlantic and Pacific oceans renders at least one set of locks necessary. The extreme rise and fall of the tide at Colon on the Atlantic is about 2 feet; at Punnus on the Pacific it is about 22 feet. At mean tide the two oceans are at the some level, but at extreme high tide the water at the Pacific end is 10 feet higher than that at the Atlantic end, and at extreme low tide, it is 10 feet lower. no regulating locks were established, let us say at the Pansama entrance, the difference in level at high tide would cause a heavy current to set up in the Causi from the Pacific to the Atlantic, and at low tide there would be a heavy current in the reverse direction would render navigation difficult. for should a shire sound remove management of macute, or should a single say 600 or 700 feet in length make a sindlen sworte for either bank when she was breasting this current, it would be difficult to prevent her taking the ground. A single flight of locks at the Pacific end would be an absolute necessity.

The Panuma Canal locks are 1,000 feet long and 110

feet broad, and the breest ship built to-day is 940 feet long and 100 feet broad. A ship of this size, then, could long and 100 feet broad iong and not rect broad. A sinji of this size, then, could use the Canal comfortably, since it would be taken through under the absolute control of four powerful, electric, towing locomotives. We think it is very doubtelectric, towing locomotives. We think it is very doubt-ful if these dimensions will be exceeded for many years to come; but even if they should be, and vessels of 1,000 feet length should be built, they would have no relation to the groblem under consideration; and this for the reason that ships of this size are built solely for the heavy damastizatic passenger trafts, and only in such service can they possibly be made remunerative. Not within the life-time of the youngest child that our

Not within the life-time of the youngest citied lane one, special out what is here being written, will there be in call for such ahipe on the various rentes which seek or will seek to pass through the Panama Cápāl.

Nature itself, however, has decreed that no sea-terel canni shall ever be constructed at this Jatimus; and in fast is to be read in those enormous masses of unstak!—material which, unsettled in their age-long equivalent to the property of the pro illurium by the digging and delving of man, are now moving slowly but with irreststible force into the cana moving slowly but with irrestatible force fint the canal priam. The problem of removing this material is very serious, it is true; but the skill and resources of the oughierer are equal to the task. The Canal will be opened ou time; an unobstructed channel for the pas-sage of skips will be maintained; and the work of transporting the débris will continue, until the last cubic yard has alipped into the channel and been removed. Then, when the angle of repose that has been ordained by nature has been reached, the Canal may

We are speaking, bowever, of a lock canal with its surface 85 feet above the surface of the adjacent oceans. If our engineers were now engaged in constructing a scu-level canal, the bottom of the excavation would have to be carried down 85 feet below its present level, and throughout the whole nine miles of the Culebra section an enormous additional slice of material would have to be taken off the slopes on either side of the canal prism. It does not take a professional mind to understand that sliding, which is so serious in a cut of the present depth, would become absolutely over-whelming were that cut carried 85 feet farther down, and the equilibrium of the mountain divide proportion ately disturbed. As matters now stand, sliding has been such that at one point, where the proposed slopes either side were three vertical to two horizontal, the flow of the treacherous material has been such that the present slope is one vertical to seven horizontal, and the whith of the cut at the natural surface of the ground has widened out from 670 feet, as planued, to a ent width of 1,800 feet.

present wath of 1,300 rose. In view of such conditions as now exist, it would not take a hold prophet to state that if the cannal were cut through the divide down to sea level, both the time and the cost of construction would be doubled.

#### Japan's Battle-cruiser Squadron

STUTENESS is a pronounced characteristic of the Japanese character, and nowhere is the sagac-ity of this people shown to such good effect as in the up-building of their navy—in which enterprise they have made few, if any, mistakes. Hence, we may rest assured that it was not without very good reason that the Japanese Government entered upon the construc-tion of the four powerful and very costly battle-crulsers, the first of which forms the subject of illustration and comment on another page of this issue. Our Navy Department, it is true, regards with disfavor my proposal to build high-speed battle-craisers for our service; holding that, in view of the limited appropriations which are available, it is best to put such moneys as are appropriated into battleships carrying the heaviest armor; since it is by such ships that the final decisive stroke of a naval conflict must be given

it may be that the Japanese strategists, having in view the conditions which would prevail in the event of hostilities with the United States, believe that they nid deal the most telling blows if a consider of the displacement of their new construction were embodied in a number of ships of great gun power of sufficient speed to elude our battleship fleet and acan engagement as the conditions see favorable or otherwise to their succe

No one who makes a study of the "Kongo" and her three sisters will deny that the quartette will add to the Japanese Navy four identical ships whose poten-tialities are very formidable indeed. A squadron whose thirms are very rormanous messed. A squarron wassess batteries agargeate 32 of the most powerful naval grass afoat, and whose speed is such that these batteries can be carried from point to point at 28 knots sustained see speed, and whose fuel supply of 5,000 tons of oak and oil will be sufficient, surely, to enable them to cross the Pacific and return without replenishment, forms a fighting unit which may well give our naval strategists nt Washington cause for serious refie

Gun for run, armor for armor, a "Rongo" with an advantage of over 50 per cent in sea speed, should prove hore that a match for any of our battlephips saterior to the "Delaware" and "North Dekota;" moreover, the Japanese admiral would not heetate to place these four ships in line for a fleet action, where, atthough they could take more than they could take, the excellent distribution of their nine to ten-inch armor, coupled with the heavy protective builkheeding, would estable them to stand some very heavy punishment. The speed, the extraordinarily wide rapps of action due to their enormous fusi supply, and the great runge and power of their batteries, would make the existence of such a feed, in the weat of bootlittice, a hard out for strategists to crack. They would resider the con-Gun for gun, armor for armor, a "Kongo" with an

vering of troops across the Paritie, specified the little, an other impossibility i and with if of colliers maeting them at points of points a squadron might work haved to our see in any case it is certain that they might below a way burden on the Nevy, through the feats which the would excite of bombardment, and the inevitable is mand which would be made in Congress for the ing of at least a portion of our battleship it

coast-defense duty.

On the other hand, we hear rumors from Gesiat.
Britain that the battle-cruiser type is to be discountinued, or rather, that it is to be merged with the parent battleship in a new type, combining the spised of the one with the high offensive and defensive qualities of the cite of the other.

#### The History We Want to Read

PACE is the child of war. The present generacivilized portion of the earth, a period of quiet and peace such as is perhaps unprecedented in the his-tory of the world. Not that all war has ceased—a look at the newspapers is enough to convince us of the con-trary—but such wars as have been waged within the last forty years or so have not—in the Western World at least—drawn flame and sword through our very rths and homes, have not even disturbed industrial and mercantile pursuits in any very distressing meas-The arts of peace have continued comparatively undisturbed.

Thus a generation has sprung up for whom war and military pursuits are of academic rather than of and animary purposes are of accessive reason with interest. But the writing and tesching of history has lagged behind the general spirit of our time. The scholastic historiau is often still content to recount for us the catastrophes and intrigues which convalsed the nations in their struggle for light and life. For the truly essential factors of human life-industry, commerce, economic conditions, science and art-these "his merce, economic countrions, secrete and art—tiese "mar-torians" have at most a passing reference here and there. But, it may be urged, such topics are reserved for specialists, for works on the history of industry, art, science, and so forth. The retort is: Then the history of wars belongs to the specialist in military science. Surely Ms field is more remote from general interests, at the present day, than that of the manu facturer and merchant. If, therefore, the general his tory written and taught for the benefit of the genera (as it must) from special surely it is more natural that it should select chapters from the history of science, art, and political eco omy, than from the records of war,

We may compare the wars through which a nation passes in the course of its evolution, to the sicknesses with which an individual battles on his way through life. What would we say of the author who should write the biography of some great man, and content himself with an account of his struggles with the measies, croup, and other allments which he sucfully encountered, until at last the grim enemy won his accustomed victory? Such an account might indeed be of interest to a specialist—to the medical practitioner.
To any other person it would appear nausoating. But this is precisely what the average historian does in re-lating the life history of nations. One would almost think that war was the chief end of human existence!

And there are so many things which we, the reading public in the twentieth century, would like to know from the historian. When did men begin to mine coal? When and how did money come into general use? How much gold has been in circulation in the several civilneed countries of the past, and how have the figures changed, and what are they now? To-day the population of the United States is about ninety-one million that of Germany sixty-five millions, of the Brit ish Isles forty-five militons, of France thirty-nine milions. But how did they stand relatively ten, twenty, thirty years ago? Who would agr that this is a matter of indifference to the nations concerned?

But above all, let not history be a mere narrative,

But above all, let not history be a mere narrative, a collection of peetly stories and romantic advantuses—though romanice has its place in history—but let us have a sober account of the history of maching, more nor less than a natural phenomenon, Let not history be presented as a series of causally disconnected events, determined by the captice of faupred individuals, but as an orderly sequence of steps da a process of evolution governed by the inscoreable laws of

Round the World in Thirty-six Days.—Dy making the elevant of the world in 95 days 21 binns and 85 minus 1. 31. Mars, approximating the New York Seviney See, has reduced the record by nearly foun days below that made by A. Jaques-Schoold in 1931. This medical back the seventh of the service operation of the various renaphoration compution, who by means of special relative addressived, to reduce delays due to unavailable needless.

Tomace in Terranea.—The grand sortal of canal occacione in July 188 was 200,393,399 cubbe yards, leaving to be converted 1.632,209 cubbe yards, leaving to be converted 1.632,209 cubb yards, leaving converted to compared with 2,259,770 cubbe yards for the converted possible month last year,

Correspondent to the control of the control of the control of the resent article in the Schwertze America on the growth of electrical refuling of steel, we note that automobile simulficiences are availing themselves of the new process for the production of mild-steel castings. One of the largest English automobile maintenances has intalled an electric furnace for supplying contains of this kind for machines made at his factory.

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The frea Mining Industry.—Statistics for the year
1900 issued by the Department of Commerce show
that there were 458 iron mines in the United States,
employing 65,176 persons, and conting for operation
and development \$74,071,380. The production of iron
ove in crude form was \$1,047,129 tons, and its value
at the mine was \$10,053,974.

Appraisal of Our Refireads.—The Interstate Commerce Commission have presented figures to the House Appropriation Sub-committees showing that a carefully worked out estimate places the cost of field work for appraising the value of the railroads in the United States at nearly \$2,000,000 per year, and as the work will county from five to seven years, the total cost will be from \$10,000,000 to \$14,000,000.

Final Conal Dredging Operations at Panama.—The various dredging units in the canal service at Panama are to be consolidated with beadquarters at Panama. The final work at Panama will be done by the two large hydrasid dredges which are noaring completion. The fuel supply for these dredges will be brought from the Atlantie and of the canal in barges, and the fuel oil will be plyed into a task at Panaiso.

Widening a Tube Railway.—The City and South London Tube Railway, the first of its kind to be built in London, is to be widened. Its present width is 10 feet 2 inches, and under the sebeme of reconstruction this is to be extended to a width sufficient to accommodate cars of the same size as those that use other and later tabe railways. These tubes are casal-iron lined, and their enlargement will call for some interestnar reconstruction work.

An Advantage of Railroad Electrification.—An inddental advantage of the use of electric traction on railroads has developed in the freight yard of the New York, New Haven & Hartford Railroad at the Hariem River, New York. The abolition of steam locomotives has so reduced the noise and smoke that land in the vicinity is now being covered with dwelling houses, which formerly was considered, because of these missances, to be uninhabitable.

The Increased Sites of Destroyers.—That there is a steady growth in the size and the power of the destroyer is evidenced by the dimensions of the latest totate of this type which are to be built for the United States Navy. They will have a length of 310 feet, a beam of 29 feet 10 inches, a draft of 9 feet 3 inches and a dimensional to 1,000 tons, with a speed of 294 kinotes. Indidentally, there will be a great increase in the cost. Bids for six ressels of this type vary from \$859,000 to \$694,500 for a single vessel.

Ship's Rudder with a Doorway.—The new Cunard hore "Aquitania," which is about the same size as the "Imperstor." is provided with a novel feature in her balanced rudder. This consists of a doorway leading to the interior of the rudder, which is of sufficient is odd and two when at any time it should become necessary to remove the pin which connects the rudder to the ship. According to the Shipping World, this pin is four feet in length and is larger than the heaviest Projectile made for modern artiller.

projection made for modorn arninery. Completing the Work's Ocean Survey.—That the work of charting the rooks' and shoals which constitute a meanes to navigation is not by any means completed is shown by the report of the Navy Hydrographer of the British Admirally for 1912, in which he states that during the year no less than 509 rooks and shoals were reported. Of this total, 10 were reported by navial vessels, 120 by surveying ships, 0 were found by ressule striking upon them, 50 were reported by avoice British and foreign authorities, and 311 were reported by volential and foreign authorities, and 311 were reported by volential and foreign governments.

colonial and foreign governments.

Ten Tenys personae in Récel and Macchinery Experta.—
Ten Tenys personae in Récel and Macchinery Experta.—
The tenys of the Bureaus of Foreign and Domestic
Commence shows that our manufactures for export
have risen from a value of 2489,000,000 in 1603 to
1200,000,000 in 1613. Maturheriand materials have
risen from 1900 to 748 millions. Teny sears ago iron and
sed manufactures conjucted amounted to 97 millions.
This years the count predicts 300 millions. Copper manufacture have gone up from 45 millions. Copper manufacture have gone up from 45 millions and the adaptate of manufacture from 51 to 130 million
and the adaptate of manufacture from 51 to 130 million
defines.

#### anti-

Suffragette Vandalism at an Observatory.—A suffragette bomb (this time a real one) was exploded on May 21st under the west dome of the Royal Observatory. Edinburgh, in immediate proximity to the 24-inch refeces and other instruments. Only the strong floor of the dome prevented serious damage from being done.

come prevented across a content of the content of t

The International Association of Academies hold its fifth meeting in St. Petersburg the middle of May. At the suggestion of the Berlin Academy a committee was appointed to encourage the organization of valicanological materials in the various countries; ultimately an international to the various countries; ultimately an international to the various countries; and as commercing link between these national bodies. An east commercing link between these national bodies. An extra was appointed to consider the resultility of introducting more scientific scale and definition of compound colors was appointed to consider the resultility of introducting more scientific scale and definition of compound colors of the control of the constitution of the constitution, was a French scheme for reforming the calendar, according to which Easter would fail on a fixed date and any day of the year would always fall on the same day of the week. The association was lavishly entertained, and the delegates were inclinically presented to the Casr. The next meeting will be held three years hence in Bertil.

As International System of Pilot-Balloon Stations is a desideratum to which Prof. Horgesoil, president of the International Commission for Scientific Aeronautics, has recently called attention. A pilot-balloon coarries no basic or apparatus of any kind; it is simply set adult, and its motion through the air is followed with a theodolile. It thus serves to determine the direction and force of the wind at different levels. In Germany these are upward of fifteen stations at which such observations are made every morning, and Prof. Hergesedl urges that other countries establish a corresponding number, in proportion to the extent of their territories. The realization of these projects would be not only of great theoretical interest to meleonogists, but since of much practical value to accronauts. It is understood that about fifty such stations will be established in Russia within the next two years.

The Expedition to Easter Island initiated by Mr. Scoresly Routledge, brief mention of which was made in the Scientric Amazarax of Reptember 21st, 1912, page 239, sailed from Palmouth, England, on Marsh 22th. An previously stated, it to object is to study the remarkable stone statues and other remains of an unknown people on this mid-Paelife Island. As there is no regular communication with the island, the party goes in a small yacht, chattered for the purpose, and all subsequently make a cruss among the less-known islands of the South Paedite. The expedition is under the ausgioes of the British Museum and the British by a great from the Royal Society, and is promised by a great from the Royal Society, and is promised urrher assistance on the part of the Chilean government and the proprietors of Easter Island. The party complete, besides Mr. and Mrs. Routledge, Mr. O. C. S. Crawford, of Oxford; Lieut. D. R. Ritchie, R.N.; and Mr. F. Lowyr-Corry, of Cambridge.

A Change in Department of Articulture Publicationa—
The Scoretary of Agriculture has announced a new plan
of publication work for his department. The old independent sories of buildins and circulars of the direct
publishing burseus, divisions and offices of the department have been discontinued and will be superveded
by a new Journal of Research for printing scientific
and technical matter, and by a department series of
buildins, written in popular language for selected and
general distribution. By this plan the confusion that
has resulted from the multiplicity of series of publications will be avoided, and the swring of a considerable
sum will annually be effected. Under the new plan
tha department will discontinue the general distribution of matter to scientific or technical is to be of little
or no use to the lay reader. It will supply bechained
information only to those directly interested and capable
of using scientific analyses, and of understanding the
results of research work couched its obesidité terna.
A larger amount of information, is popular form which
the average resider and muchanished productive or wide
the advantage, and thereby increase the agricultural
productiveness and the health of the nation, will hereafter be distributed.

100

#### Automobile

Heating the Steering-wheel Rim.—To avoid the difficulties resulting from a cold-steering wheel, Rueben S. Smith of Marshall, Toxas, in a patent, No. 1,062,745, arranges an electric heater of a special construction described in the patent, in the hollow rim of the handle wheel, so that the rim will be heated electrically.

Two Patents to Howard E. Coffin.—Howard E. Coffin of Detroit, Mich., has secured two patents, Nos. 1,060,-819 and 1,060,820, relating to starting devices for explosion engines in which compressed air is utilized by a novel valve arrangement in securing the automatic starting of the enrine.

Heed Lamps That Shift Automatically.—In a patent, No. 1,063,962, Charles C. Bruff of Cualport, England, mounts the head lamps of automobiles with vertical reflectors which can be rotated in front of the lamps and are automatically and simultaneously rotated in accordance with the turning of the automobile so that the beam of light from each lamp is divided and an area is illuminated which extends both directly in front of the vehicle and in the direction in which the vehicle is being turned.

A Bell That Sings When the Tire is Defiated.—Hermann Jacoby of Eberstadt, near Darmstadt, Germany, in a patent, No. 1,062,567, shows in connection with a pneumatic tire, a bell and a spring actuated sounds therefore, normally clear of the bell, and having a portion projecting relatively near to the ground surface and alongside the tire, so that any unusual defaults of the tire will cause the said part to strike the ground and result in a sounding of the bell.

A Novel Asti-akid Device.—A patent, No. 1,062,018, has been issued to Thomas Townend of Winnepog, Manitoba, for an attachment to automobile wheels wherein it is sought to grevent the wheel from skidding or slide advense by providing a series of spring-controlled dogs or claws which may be depressed to engage the ground surface, an adjustable wheel being provided to depress the dogs to a position beyond the erreumference of the tire at the under side of the wheel as the latter rotate.

A Novel Wheel Rim.—Victor Lindholm of Hoquiam, Wash, has patented, No. 1,053,888, a wheel rm, unsuffange of which has an entrance opening, which can be closed by suitable means provided for that purpose. The tire is composed of a series of sections of wire rependesed in a rubber casing and bent longitudinally to enclosed in a rubber ossing and bent longitudinally conform with a conventional ure with the sections helded at their ends in tubes wheel can be slipped through their at their ends in tubes wheel can be slipped through their suitable position, so that the tire will be emposed of a number of these sections resting side by side and extending the sections are suitable positions.

Car Russ 83.5. Miles on a Gallon.—Executing by many miles any previous world's reword for mileage on a given quanty these, a Frakkin car, in an fitted set spread quanty free, a Frakkin car, in an fitted set spread quanty free, a Frakkin car, in an fitted set of the control of

Bealten of Brakes to Car Weight.—In the May 10th issue of the SERNIPIC AMERICA, there was published an item on Brake Capacity and Efficiency. The statement, attributed to Prof. C. B. Veal, of Purduc University, that brakes should be designed with one square inno do braking surface to every tem pounds of car weight, should have been given as one square innet to every fifteen pounds of gross ear weight. In pointing on the error me this item Prof. Veal informs us that the coefficient of friction will be determined by the kind of maternal and finish employed in the brake drum and in the liming: and that this coefficient, the heat and wear resuting qualities, design of the brake, as well as the relation of the peripheral velocity of the road wheel to that of the brake drum, all have a direct bearing upon the amount of brake surface required. In general practice the relation of wheel diameter to brake drum diameter varies between 2½ to 1 and 2½ to 1 for pleasure cars, while for a loaded truck this ratio may run as low as 1.8 to 1. In the latter case the amount of brake surface per unit of weight may be reduced by one half the above value for pleasure overs. In both pleasure and commercial velicies, in the contract of the pleasure overs. In both pleasure and commercial velicies, in the contract of the pleasure overs. In both pleasure and commercial velicies, in the contract of the pleasure overs. In both pleasure over under the decided of the peace that the above value for pleasure overs. In both pleasure and commercial velicies, in the contract of the pleasure overs. In both pleasure and commercial velicies, in the contract of the pleasure overs. In both pleasure overs in the profession to the increase in brake-drum velocity, since oving to the mechanical advantage gained in the peace reduction the same retarding effect can be sourced with less braking effect.

### An Integrating Opacimeter for Stellar Photography By Jacques Boyer JULES BAILLAUD has pro

ted before the M. Academy of Sciences of Paris an opacimeter ers in which will render valuable service to astrono the study of stellar photographs. The opacimeter

which is now most extensively employed in astronomical observations Hartmann's microphotometer, which, though excellent in its way. does not appear to satisfy all demands completely This instrument produces, by means of microscope objectives of high magnifying power, real images of the photographic ity from one end to the other. The grain of the silver deposit is seen in both images, and the measurement consists practically in comparing the distinction of the grain in the of the scale comparable with the star image. Hence the scale must star image reene grain as the star plate, and it must therefore be changed for each new emulsion and

Another requirement, still more important and more difficult to realize, is that the star images must be perfectly homogeneous. This is never the case with extra-focal images; those formed by modern lustru-ments do not show visible wings. but they are more transparent at the center than at the edge Schwarzchild has overcome the dif-ficulty with his "Schradiercassette," but this is an ex-

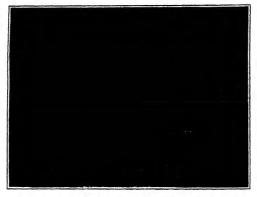
tremely complicated apparatus, and it cannot be used some kinds of astronomical work. For example, would prevent the simultaneous employment of photographic equatorial and a telescope of short

It seems preferable to adopt an optical system and logous to that of the Gouy spectrophotometer. This has been done in the Baillaud opacimeter, a plan of which is shown in the accompanying diagram

In Baillaud's justrument, as in Hartmann's, the star plate B is compared with the scale E with the ald of two telescopes, I and II, and a Lummer and Brothun double prism P, which is cemented together and forms a cube. The central part of the diagonal surface is clear, and transmits light from the telescope I, whose onter parts are silvered, and reflects light from the telescope II in the present instrument, however, the two objectives L L' are focused on the plate B and the scale E, so that the prisms are traversed by pencilthe scale S, so that the prisms are traversed by penculs of parallel rays. A leas L receives both penculs, and forms superposed images of the plate and the scale in the plane of the cychole O. The eye pisced behind this aperture receives the whole of both luminous pencils and, looking at the lens L, compares the illuminaed by the rays tion of the central spot, produc from the star plate, with the illumination of the surrounding annular zone, produced by the rays co from the standard scale, and reflected on the double

The region of the plate under observation is the are whose image is bounded by the eyehole. This area is inversely proportional to the magnifying power of the optical system  $L.L_{ii}$  which, in turn, is proportional to the ratio of the focal lengths of the two lenses. Each of the telescopes I and II, which are exactly alike, is

respectively. The advantages possessed by the are Bailland opacimeter (a duplicate of which has been in stalled in the observatory of Buch very evident. In the first place, it is possible to a with this instrument the aggregate transpare any part of a plate lacking in uniformity.



Bailiaud's integrating ope actmeter, employed in the study of stellar photographs in the Observatory of Paris.

one standard scale is required and the comparison is made between the brightness of two adjacent unrinces

When the stellar image is very beteroger

cially when the edge, bounded by the eyehole, is much lighter than the central part, the central part of the field of view ap-OA pears bordered by bright bands which change in aspect with the slightest movement of the eye ť, aud make the m uncertain

Plan of Baillaud's opacimeter.

This defect is remedied by the addition of a small view telescope IV focused upon the aperture in the silvered surface of the double prism, and provided with a diaphragm (which serves the same purpose as the eyehole), and an eyeplece V, which forms an image of this diaphragm on the pupit of the observer's eye. The can suparagm on the pupit of the observer's eye. The central aperture of the silvered surface still appears to be bordered by a bright band, but this is fixed in posi-tion and brightness, and does not diminish the accuracy of the settings, provided that the measures are made by contrasting the brightness of the two surfaces sep-

When the instrument is used in this mass truly an integrating openimeter, which it total illumination produced by the rays

image.

#### Cathode Rays from In descent Lamps

By Our Berlin Corresp

WHEN a curbon filement femo is operated at a tensi normal (for instance, a 60-volt lamp at 75 volts) a bluish glow is sometimes seen to fill the whole bulb, which, in the spectroscope, shows the lines of mercury. This glow, on account of the gas give out by the bulb or the filement, w w111 disappear again after two to three minutes. On approaching a horsewhose the income through the income incom

en recently investigated by Prof. L. Houllevigue of Marse versity, are evidently due to the electrons given out from the carbon filaments, and which by striking the residual mercury vapor in the will render this luminous.

When glass reservoirs of differ-ent forms are cemented to the bulb and the apparatus is connected with

and the apparatus is connected with a Gaede air pump, the glow is seen to penetrate into the reservoir to a distance that increases with the vacuum and the heat of the filament. If in the apparatus are inserted electrodes kent at different u, the glow is seen to behave like a gase negatively charged in bulk, that is to say, it is attracted by positive and repelled by negative charges. The effect of a magnetic field is not very marked; while the glow is seen to contract, no lateral deflection, in acc ance with the laws of electro-magnetism, is obs

These phenomena seem to suggest that the glow is due to electrons sent out from the negative end of the filament, which after traversing complicated paths in the interior of the reservoir, return to the positive end.

Interesting phenomena are also obtained with an arrangement similar to that used for the production of canal rays (Fig. 2). An incandescent built A is connected with the reservoir B by a tube T which contains either a platinum coil or a hollow platinum cylinder raised to a higher potential than the filament; this is how an electrical "acceleration" field, adjustable at will, is established between T and the filament. Under e circumstances the same diffuse lumines before is obtained in the reservoir B, provided the vacuum be sufficient, except that it contains a considerably brighter beam of rays with accurately defined The same phenom lamp worked at normal tension, but it is altered dis tinctly by any slight variation in the operation

A characteristic feature of the rays is their extra-ordinary sensitiveness to the action of magnets, even the terrestrial field being sufficient to produce an ap-

From the experiments made with these rays it is concluded that they are real cathode rays of compar-tively low speed, say about 5,000 kilometers per secon



nt lamp giving out slow cathode rays,



Fig. 2.—An arrangement similar to that used for production of canal rays.



Pig. 3. -0



There is the of Castlers as a fuel manager of the state o white-on one or more of the atlanting neavier pild seem that much has already been ac-along this line, since the Standard Oil Com-by assessment that it had brought out a new "motor spirit," which takes the place of

rust withing "matter spirit." which takes the place of gasolies, say in some inhances gives even more power than the says quantity of gasoline.

On the chier hand, great advancement has taken piece in the development of apparets to increase the power derived from existing fuels such as keroseou, aschold, distillates and heavy oils. This was clearly and convincingly demonstrated in a recent test in New York city of the G. O. vaporise which has been introduced into this country by an English firm. This vaporise takes the place of the minifer on the vahicle and recentles it in appearance. It is constructed in such a manner that the fuel, in being drawn through at, is subjected to the heat of cast from socumitations which are kept at a high temperature by the

through it, in subjected to the heat of cast from accum-intoths which are kept at a high temperature by the arhitust; gases. Thus the twel is vaporised before it reaches the carbureter and is in proper condition to be mixed with outside air to form the explosive mixture.

the test mentioned several different fo in the test members everal uncertaintees were tried. These included gaseline, kerosene, denatured alcohol, heavy oil distillate and a refined pine wood dis-trilate having the nature of turpentine. With the enrunning at 1,500 revolutions per minute, 66 horses was obtained with gasoline when operating entry with the carbureter. With the vaporier switched is between the fuel supply and the carbureter, the horse power derived from gasoline, at the same motor speed, was 67; with keroseas, 67; with the turpontine spirit, 67.2; with distillate, 68.5; and with alcohol, 61. The consumption of gasoline with the carbureter was 0.8 of a pound per horse-power per hour, while this figure was to 0.7 with the introduction of the vaporiser,

responseting a saving of 12% per cent.

The following table shows the exhaust gas analysis at two different speeds of the motor, first with the carbureter and then with the vaporiser:

#### EXHAUST GAS ANALYSIS.

	-With	carburetet-	~With	vaporiser-
Speed	1,200	1,600	1,200	1,600
CO,	9.6%	7.4%	12.0%	10.2%
co	1.5%	3.2%	0.6%	2.8%
0	2.2%	4.3%	0.4%	0.8%

The temperature at which the fuel is mixed with air in the vaporiser varies between 550 and 750 deg. Fahr. A certain amount of air passes into the vaporiser and is raised to this temperature, although the mixture is reduced to a temperature of about 122 deg. Fahr. on being mixed with additional air in the carbureter.

#### poving Carbon Deposit with Oxygen

CARBON deposit in the cylinders and valves of in-ternal combustion engines has always been one of the great disadvantages of this class of motive power. This is emphasized more strongly in the automobile Thus is emphasized more stringly in the automobile motor than in any other type of engine on account of the frequency with which it is found necessary to take down the cylinders and remove the valves for the pur-pose of getting rid of the carbon deposit.

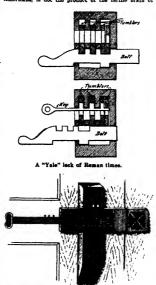
ever, the motorist may now rejoice, sw quick and easy method has been found by means of which the worst car-bon deposit may be cleaned out of the engine in a few minutes without the necessity of taking down the motor or re-moving the valves. The device is known as the Dy-Karbo, and is shown in opera-tion in the accompanying Blustration.

as the 17-k aroo, that is shown in observation in the accompanying illustration.
The outsit consists of a tank of exyrcu gas, a speaking wide of a tank of exyrcu gas, a speaking wide of a tank of exyrcu gas, a speaking wide of a tank of exyrcu gas, a speaking wide of a tank of expensive base and at a tercah. Out the end of the storch has a final-tile copying tales out gastl bore and of the force has a final-tile copying tales out gastl bore, and the storch has a final-tile copying tale of the storch has a final-tile copying tale of the storch has a final-tile copying the similar copying condition units of a speak of the storch distribution of the storch distrib

fect the instant the crimders and valves are clean. The process affects only the carbon and does not attack the metal of the cylinders. In a cylinder where the carbon deposit is extremely heavy, only a few minu required to burn all of the deposit away.

#### The Prototype of the Yale Lock By Walter Schumann

N OT long since I had opportunity to discover that the principle of the Yale lock, so well known to Americans, is not the product of the fertile brain of



Egyptian pin-type lock invented of sand years ago.

s, as I had hitherto always ised, but that it was known to ancient Romaand was in use by them, as early as the beginning of the Christian era, if not before.

Far up among the Taunus Hills, about half an hour's trolley ride from the well-known German spa of Homburg, the erstwhile favorite watering place of the late King Edward VII. of England, on a commanding hilltop, is an old Roman outpost that was destroyed by the barbarians. Of late years, however, and at the instance of archeologists, the site of this outpost has been thoroughly investigated, the ruins laid bare, and on the original foundations the walls of the outworks as well as the inner buildings have been reconstructed rding to Roman tradition

Among the many articles of use and ornament discovered in the course of the excavations, all of which are exhibited in one of the reconstructed buildings, the thing that interested me most was the style of lock that had been in use by these Romans. It is built precisely on the principles of the modern Yale cylinder lock with its tumblers and serrated key. I procured a replica of one of these locks (there were a number of a, each with a different combination of tumblers) and I herewith submit a drawing of it.

One of the drawings shows the lock closed and the key withdrawn. It will be noticed that the four tumblers have dropped into the serrations of the bolt and securely hold it to place, preventing it from being slipped back. The other drawing shows the key in-serted in the slot, the tumblers raised, and the bold situped back.

A glance is sufficient to note that the lock is built on the same principle as the modern Yale cylinder lock , the only difference being that in the Roman lock th key, after being inserted in the slot, is lifted upward in order to raise the tumblers, and that the bolt is then slipped back with the other hand; whereus, in the Yale lock the key is turned and not only lifts the tumblers, but at the same time releases the bolt.

It is perfectly evident, however, that the principle is the same in both locks, and little do we think, as we slip the little serrated key into the lock when we enter our home, that the ancient Romans unbolted the doors to their houses in practically the same way

[A much older lock employing the "Yale" principle was described in the SCHENTIFIC AMERICAN of Scotem ber 2nd, 1890 The lock, as shown in the accompany-ing drawing, is of the pin type and was used some 4,000 years ago in Egypt Similar locks are still to be seen in some of the older streets of Cairo—Editor |

#### The Inventors' Guild and the Oldfield Bill

A T a meeting of the Inventors' Guild, held in New York city, on May 28th, resolutions were adopted in which the Oldfield bill was strongly condemned. 1 n solutions an invitation is extended to the Chamhers of Commerce in the principal cities of the United States and similar representative organizations to aid the Gulld in its efforts to secure the appointment of a special commission, which will make a thorough and careful study of the American patent situation and then recommend to Congress such changes as may appear It will be remembered that in 1911, the Guild petitioned President Taft to have such a commission appointed President Taft responded by sending a special message to Congress on the putent system ich the recommendations of the Guild were in

dorsed. Congress did absolutely nothing in the matter.

There is reason to believe that President Wilson is not indifferent to the faults of our patent system. In his "New Freedom," he comments upon the difficulty many inventors now experience in "resping the full rruits of their ingenuity and industry," and he states that "one of the reforms waiting to be undertaken is a revision of our patent laws."

But whether or not the President will of his own

initiative arge upon Congress the necessity of patent reform, there can be no doubt that if the present plan of the Inventors' Gulld is carried out, Congress cannot remain in-different. The Chambers of Commerce of our large American cities, representing us they do the industrial interests of thousauds, dependent upon absolute justice and fairness in the granting and upholding of natent rights cannot be broared. So far as we are aware, the Cleveland Cha her of Commerce is the only body of this aracter which has considered the puter situation at all. Indeed, its admirable. critical study of the Oldfield bill, and its report on the patent system of the United States, notedated and probably hispired the present resolutions of the Inventors' Guild. If the example of the Cleveland er of Commerce were followed, who can doubt that Congress would be induced to appoint a commission which thoroughly study the natent system and which would result in the enactment of the kind of legislation that would meet with the approval of inventors, manufac

For years business men have pointed out the need of a new Patent Office building, a simpler and more efficient system of Patent Office administration, and readier means of bringing infringers of patent to book, but Congress does nothing



### Comparison of French and German Strength in Dirigible Airships

#### Why Germany is the Leading Air Power

I N a recent number of La Nature, there appears a critical estimate of the relative all strength of Germany and France. Insemuch as these two powers have been keen rivals in attaining what may be called a supremacy of the fit, an abstract of our French contemporary's article will doubtless prove of interest to

As regards the French dirigibles, the three most recent nerial cruisers, as well as the largest (8,000 cubic meters), finited (5 kilometers per lour), and the best equipped, are the "Adjudant-Vincenot," located at Toni: the "Adjudant-Reau," at Verbus; and the "Duppy-deloues," at Manleuge. To these should be added the "Pileurus," which exceeds them in speed (58 kilometers

"Figures," which accesses the an hour), but has not as great a gas capacity (6,500 cuble meters). On the first three engines of 200 to 250 to

The table lists the French dirighties which have notually been hullt, including privately owned craft, which can be commandered in time of war. The names of these are given in Italies.

Most of the Freuch dritalines are of the flexible or
non-rigid 13 pe (8). Hetween 180s and 1011 Franceball four sensity completed
(8). The rescuity completed
(8)-prison," a wood-frame
dirigitio, marks the entrance
of France into the field of
rigid dirigitios (IL.) litherto dominated by Germans. On the other hand, it should be noted that one of the flexthic types, the triboled type
invented by the Spanish engineer, Torreso Quevedo, and
built in France by the Astra
Company, presents advantages nanologous to those of
the rigida, because of this
means adopted to preserve
the shape of the envelope
under varying conditions of
temporature and gas pres-

Such as it is, our French contemporary admits that the French fleet of aerial crutaers is interfor in number, gas expactly, speed, and radius of action to the German The difference is even greater than shown in Table 1, for Lo Marier has sibuliated only the best French airbilips, vessel is wit if he would be immediately available in case of war. Most of the others are either betting repaired or remodeled. For example, the new "Spless" rigid will be available only

niter a long period of testing.
By the end of 1013 the
French military neconautic
authorities will surely have
put in nervice neven intremilitary dirighties of 20,000
cubic meters gas a capacity
and a speed of 75 kilometers
an hour. The four large airship manufacturers (Bayard-Glement, Astru, Zodies,
and Lebaudy) expect to construct four large privatelyowned cruisers as well as
four other dirighties of the

Military dirigibles of over 8 000 cubic meters gas capacity are called oraters gratose of 5,000 to 5,000 souts, and the smallest, redeties. "Fleuras" type, which will be built by the first three of the above-meutioned firms. Hence, taking account of delays, etc., by the end of this year France may have a dozen large dirigibles actually in service, though these will be interfer to the large German cruisers.

Germany's dirightle strength is shown in Table II. What strikes us at once is the large number of stidd cruisers and their gas capacity, speed, and radius of action. We may add that the available lead they are capable of carrying surpasses the tons for the large Zepyelins ("Victoria-Labe," "Hansa," "ZS") and six tons for the latest marine dirightle.

In the table the Zeppelins are indicated by the letter Z (or L for the marine dirigible), the Parsevals by

P or PL, the Ruthenbergs by R. La Nature omits the three (frees military semi-rigids formerly designated by the letter M. One of these, after being regulated, will be stationed at Mets. Notifier has In Nature included "Ad," which figured in the Lunwillé incident. "PLO" and "PLO" are out of service.

This talle does not pretend to be complete, nor evan to be very exact, since changes in aeronautic organization, as well as in the stations of airchips, are frequent and secret. Thus the names of the stations must be considered merely as an indication. "23," for instance, indicated as attaches to Pherlin, is really said to be destined for Metz. Likewise it is impossible to know from day to day which craft are in commission. But

rart are in commission. Set the list reproduced from Lo Nature suffices to show that Germany does not possesse forty Zeppelins, as the European press has frequently asserted.

Though only one Suchard is given in the table, there is a second Nuchard, which is a necessary of the such as a second Such as the city of the table the command of Capt. Hruncker, was intended to vayage from Lass Palmas (Camir, Islands) to the West Indies. As for the Parseuril type, its gas capacity is 12,300 cmbic meters with it car 10 meters long und a 200 hove-power earlier and a 200 hove-power earlier.

While it is impossible to state definitely to which sirship harbors German dirighter are attached, it is certain that they can be housed in eighteen slicks of the fixed or tunnible type. These sheds are situated at Berlin, Bleedorf, Potedam, Königsberg, Posen, Kiel, Hamburg, Dissedorf, Leich hil ngen, Chingne, Meta, Frankfurt, Mambletin, Beden, Sirussburg, Gotha, and Friedrichshafen.

It is perhaps the privatelyneued dirichles ("Victoria-Ladae" and "Hanse") which are the usoft dangerous. They are or will be completely armed. The narine "11" even carries a machine gun It is to be particularly noted that the Germans have seriously stided not only the character of weapons, but also methods of firing. The crews of dirighties are trained in target practice to hit objects on the

All the dirigibles except the Parsevals are equipped to send or receive vireless messages. In the five facincies (at Munich, Friedrichshafen, Mannheim, Berlin, and Bitterrick) new sints are sit present in course of construction, of which six are pivestaj-owned dirigibles (one Zeppelin and five Parsevalis).

Station	Name of Dirigible	Date and Type.	Capacity in Cubic Moters.	Length. Motors.	Diameter, Meters.	н. Р.	(Kliome ters per Hour).
	TABLE	g 1,—pre	NCH DIRIG	LRLBS.			
Toul .	Adjudant-Vincenot	19118.	9,000	89	12.80	200	56
Verdun	Adjudant-Reau	19118.	8,950	87	14.02	240	58
Maubeuge	Dupuy-de-Lome	19128.	9,(XX)	80	12 80	250	55
	Selle de Beauchamp	19118.R.	8,000	89	14 60	150	50
	Fleurus	19128.	6,500	77	12 50	160	58
Saint-Cyr.	Le Temps	19118.	2,500	50	9 50	70	50
	Zodsac-5	19098.	1,430	42	8.20	40	45
Epinal.	Capitaine-Ferber.	19118.	(1,000)	76	13	140	55
	Commandant-Coutolio		9,000	,		380	
Chalons .	Capitaine-Marchal.	19118.R.		84.50	13	150	47
	Lieutenant-Chauré	19118,	8,950	87	14	240	55
1	Transacrien	19128.	9,000	76	14 50	300	55
lasy	Conte	19128.	6,600	65	12	150	50
	Colonel-Renard	19106.	4,200	66	11	100	50
	Astra-Torres	19116.	1,600	47.50	8	55	50
Meudon	Lebaudy-4 .	19118.R.	3,300	61	10 50	70	45
uu	Liberté	19098, R.	4,800	71.50	13	120	1
Lucerne	Ville-de-Lucerne	19098.	4,450	60	13	100	44
DUON IN	Spiess	1912R.	11.500		13	400	?
	TABLE	JI.—OFR	MAN DIRII	IBLES.	Li		,
Metz	7-1	л.—овя 1912R.	MAN DIRIU	191.Es. 126	12	230	
Metz	Z-1 P-1		-	126 60	12 10.50	230 85	58 51 5
	Z-1 P-1 L-1	1912R.	12,000 4,000 22,000	126 60 160			
Metz Hamburg	7-1 P-1 L-1	1912R. 1908R.	12,000 4,000	126 60	10.50	85	51 5
Hamburg .	Z-1 P-1 L-1 Victoria-Luisc PL-1	1912R. 1908R. 1912R. 1912R. 19088.	12,000 4,000 22,000	126 60 160 147 50 60	10.50 15	85 510	51 5 83 5 80 45
	Z-1 P-1 L-1 Victoria-Luise	1912R. 1908R. 1912R. 1912R.	12,000 4,000 22,000 18,700	126 60 160 147 50 60 45	10.50 15 14	85 510 450	51 5 83 5 80
Hamburg .	Z-1 P-1 L-1 Victoria-Luise PL-1 PL-10 Clouth	1912R. 1908R. 1912R. 1912R. 19088.	12,000 4,000 22,000 18,700 3,200	126 60 160 147 50 60 45 42	10.50 15 14 8 50	85 510 450 85	51 5 83 5 80 45
Hamburg .	7-1 P-1 L-1 Victoria-Luise PL-1 PL-10 Clouth 7-3	1912R. 1908R. 1912R. 1912R. 19088. 19128. 19098.	12,000 4,000 22,000 18,700 3,200 1,800 1,840 20,000	126 60 160 147 50 60 45 42 149	10.50 15 14 8 50 9	85 510 450 85 100	51 5 83 5 80 45 50 32 80
Hamburg .	7-1 P-1 U-1 Victoria-Luner PL-1 PL-10 Clouth 7-3 P-3	1912R. 1908R. 1912R. 1912R. 19088. 19128. 19098. 1912R. 19118.	12,000 4,000 22,000 18,700 3,200 1,800 1,840 20,000 10,000	126 60 160 147 50 60 45 42	10.50 15 14 8 50 9 9 50 14 15	85 510 450 85 100 50	51 5 83 5 80 45 50 32 80 67.5
Hamburg .	Z-1 P-1 L-1 Victoria-Lurse Pl-10 Clouth Z-3 P-3 R-2	1912R. 1908R. 1912R. 1912R. 19088. 19128. 19098. 1912R. 19118.	12,000 4,000 22,000 18,700 3,200 1,800 1,840 20,000 10,000 1,700	126 60 160 147 50 60 45 42 149 86 46	10.50 15 14 8 50 9 9 50	85 510 450 85 100 50 510	51 5 83 5 80 45 50 32 80 67.5 38 5
Hamburg .	Z-1 P-1 Vetoria-Lurer PI-1 PL-10 Cloub Z-3 P-3 R-2 R-2	1912R. 1906R. 1912R. 1912R. 1908S. 1912S. 1909S. 1912R. 1911S. 1910S.R.	12,000 4,000 22,000 18,700 3,200 1,800 1,840 20,000 10,000 1,700 3,060	126 60 160 147 50 60 45 42 149 86 46 65	10.50 15 14 8 50 9 9 50 14 15	85 510 450 85 100 50 510 400 75	51 5 83 5 80 45 50 32 80 67.5
Hamburg .	Z-1 P-1 L-1 Victoria-Luner PI-10 Clouth Z-3 P-3 R-2 R-3 R-1	1912R. 1908R. 1912R. 1912R. 19088. 19128. 19098. 1912R. 19118. 19108.R. 19128.R.	12,000 4,000 22,000 18,700 3,200 1,800 1,840 20,000 10,000 1,700 3,060 7,500	126 60 160 147 50 60 45 42 149 86 46 65 68	10.50 15 14 8 50 9 9 50 14 15 7 30 11 15	85 510 450 85 100 50 510 400 75	51 5 83 5 80 45 50 32 80 67.5 38 5 51 5
Hamburg .	Z-1  P-1  L-1  Victoria-Luser  PI-1  PI-10  Clouth  Z-3  R-2  R-3  R-5  PI-0	1912R. 1908R. 1912R. 1912R. 19088. 19128. 19128. 19118. 19108.R. 19128. R. 19108.	12,000 4,000 22,000 18,700 3,200 1,800 1,840 20,000 10,000 1,700 3,060	126 60 160 147 50 60 45 42 149 86 46 65 68	10.50 15 14 8 50 9 9 50 14 15 7 30 11 15 9	85 510 450 85 100 50 510 400 75 120 220 50	51 5 83 5 80 45 50 32 80 67.5 38 5 51 5
Hamburg .		1912R. 1908R. 1912R. 1912R. 19088. 19128. 19098. 1912R. 19118. 19108.R. 19128.R.	12,000 4,000 22,000 18,700 3,200 1,800 1,840 20,000 10,000 1,700 3,060 7,500	126 60 160 147 50 60 45 42 149 86 46 65 68	10.50 15 14 8 50 9 9 50 14 15 7 30 11 15	85 510 450 85 100 50 510 400 75 120	51 5 83 5 80 45 50 32 80 67.5 38 5 51 5
Hamburg	Z-1   P-1    L-1    L-	1912R. 1908R. 1912R. 1912R. 19088. 19128. 19128. 19118. 19108.R. 19128. R. 19108.	12,000 4,000 22,000 18,701 3,200 1,800 1,840 20,000 10,000 1,700 3,060 7,500 1,800	126 60 160 147 50 60 45 42 149 86 46 65 68	10.50 15 14 8 50 9 9 50 14 15 7 30 11 15 9	85 510 450 85 100 50 510 400 75 120 220 50	51 5 83 5 80 45 50 32 80 67.5 38 5 51 5 46 5
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Hamburg  Bitterfold  Berlin  Potedam	71 P-1 L-1 L-1 P-1 P-1 P-1 P-1 P-1 P-1 P-1 P-1 P-1 P	1912R. 1908R. 1912H. 1912R. 1908S. 19128. 19098. 1912B. 19108. R. 19108. 1912S. 1911S.	12,000 4,000 22,000 18,700 1,800 1,840 20,000 10,000 1,700 3,060 7,501 1,800 1,800 1,800 1,800	126 60 160 147 50 60 45 42 149 86 46 65 68 45 70 76	10.50 15 14 8 50 9 50 14 15 7 30 11 15 9 15 16 50	85 510 450 85 100 50 510 400 75 120 220 220 220	51 5 83 5 80 45 50 32 80 67.5 38 5 51 5 51 5 48 5 60 45
Hamburg  Bitterfold  Berlin  Potedam		1912R. 1908R. 1912R. 1912R. 1912R. 19128. 19128. 1912R. 19108. R. 19108. R. 19108. 19118. 19118.	12,000 4,000 22,000 1,8701 3,200 1,840 20,000 1,740 3,060 7,500 1,800 8,050 11,700	126 60 160 147 50 60 45 42 149 86 46 65 68 45 70 76	10.50 15 14 8 50 9 50 14 15 7 30 11 15 9 15 16 50	85 510 450 85 100 510 400 75 120 220 50 220 450	51 5 83 5 80 45 50 32 80 67.5 38 5 51 5 51 5 46 5 60 45
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Hamburg Bitterfeld Berlin Berlin Cologne	Z-1   P-1   L-1   Victoria-Luiwe   P1-1   P1-10   P1	1912R. 1906R. 1906R. 1912R. 1912R. 19088. 1912R. 1912R. 19108. 19108. R. 19108. 19118. 19118. 19128. 19118.	12,000 4,000 22,000 18,700 1,800 1,840 20,000 1,700 1,700 1,700 1,700 1,700 11,700 11,700 17,250 8,050	126 60 160 147 50 60 45 42 149 86 46 65 68 45 70 76 147 50 140 80	10.50 15 14 8.50 9.50 14 15 7.30 11 15 9.15 16.50 14 14	85 510 450 85 100 50 510 400 75 120 220 50 220 450 300	51 5 83 5 80 45 50 32 80 67.5 38 5 51 5 46 5 60 45 80 77 63



Comparison of French and German dirigibles and the location of the grinding German air

#### Corremondence

The editore ere not responsible for statements the sector are not responsely for electronics to be the correspondence column. Anonymeus com-adiations cunnot be considered, but the names of respondants will be withheld when so desired.]

#### Extending the Law of Unfair Competition

To the Editor of the SCIENTIFIC AMERICAN:

The "Sanatogen" decision is in keeping with public centiment on the matter of the right of a manufacturer to fix the retail selling price on patented articles, and of recent years court decisions are apparently greatly influenced by public demand. There about do to making the court of the cou Federal law governing unfair competition, so as to enable all manufacturers of any advertised or trade-marked an manuscourers or any adversion or crans-marked article, patented or unpatented, to maintain a uniform retail price thereon. Where price cutting is permitted, the tendency is to place the small retailer in a position re it is impo sible for him to compete with his larger competitors.

Measure you of the approval of this company with the efforts of the Surentino American to further the cause of merchandising in a manner profitable to all dealers, manufacturers, and the general public

AMBRICAN THERMOS BOTTLE COMPANY WILLIAM B. WALKER, President.

#### Cast Steel Ties and Screw Spikes

To the Editor of the SCIENTIFIC AMBRICAN:

A most interesting article appeared in the issue of June 7th, 1913, on "Borow Spikes;" you also speak of the antiquated practice of American railroad builders; also of the tie plates outting into the surface of the wooden ties. I inclose herewith a out of a seriew spike, which I have found very useful in connection with cast steel ties which were man-

with easy steel the which were man-infactured several years ago and placed into the tracks of the Le-high and New England Railroad, where they have been in service since, also an insulated oset steel to which is in service on the Lehigh Valley Railroad.

se ties combine tie and tie plate, are elastic, light, strong, and would wear indefinitely. The screw spikes are fastened into blocks or some other substance used for that purpose, for which receptacles have been provided at each end of the tie. The blocks or other material can be replaced without moving the tie, so that neither ballast need be removed nor service of the track impaired while repairs are being

On an electric road they are a most valuable asset, since repairs on city stree would be reduced to the smallest minimum. The ca street would be reduced to the smallest minimum. The cast steel it is preferable to any rolled device, since the latter require bolts and elips, which are a continual appears and dangerous, while some uplies are used with cast steel ties, thereby insuring safety. The accompanying photographs show two of the ties in position, also a server spike.

Bethleben, Pa. MILTON M. MITMAN.

#### How the Consumer is Affected

To the Editor of the SCIENTIFIC AMERICAN:

the Sciitor of the Scientific American; rice cutting does not lower the coat to the con-ser. It can only lower the quality to the con-er. Price cutting, in encouraging and necessitat-the lowering of quality, works injury to the consumer. ing the er. distributor and producer.

Modern competition comprehends price, quality and service. If competition must depend on price since, both quality and service must suffer. Advertised trade-marked goods are sold at the least expense to trade-marker gloos are soir at the less appears the consumer because advertising is the most communal form of salesmanship when properly performed. If the manufacturer cannot legally fix, his own selling price, he has no foundation upon which to build his

gradity and his service to the consumer.

Everything is made or done with the consumer in view. The consumer benefits or suffers in ratio to the ability and prespectity of the various distributors and producers.

the shifty and prespectly of the various distributors and producers.

The producers and distributor must be paid for their severies to the consistence just as the consumer is paid for the service he renders in his particular line of endeavor. Therefore, the price of every settless same include a profit to pay the producer and distributor for wheir work.

Thrifts pressessingly composition, also prices, of an article state to resiscensitely. If the protoc is not resemble, and if it is involved only the producer and the prices of the protoc in the prices, of the protoc is not resemble, and if it is involved only the protoc is not resemble, and if it is involved only the protoc is not resemble, and if it is involved only the prices of the protoc in the prices of the prices of the protocol protocol

salish manufacturer, having an article of equal quality, will sell his goods at a legitimate price that includes no excosses, and, therefore, will secure the business that formerly went to the other manufacturer. Thus, the very lact that any article can remain on the market at a fixed price for any length of time is proof that is is good value. Granted, then, that the prices of such articles include only a fair profit for the distributor and producer. If such a profit is cut, it must follow that either the producer or distributor is not being pad for his work.

for his work.

to nis work.

If continued price cutting so lowers the prestige
of this article that the previous fixed price can no
longer be secured, the cut price will soon become
regarded as its fixed price and the producer and
distributor cannot figure on getting any higher price

distributor cannot figure on government for the goods.

It is, however, obvious that the distributor and producer must be paid. If, therefore, they can only depend on a lower price, they must lower the quality of the goods, so that their profit may be secured even at the reduced price. When such a cut price is established, the consumer really stands a loss through reduction in quality of the article, which

formerly sold at the larger and legitimate price.

Therefore, I believe any legislation aimed toward
eliminating this evil is essential to the good of the
country. It should be instituted as vigorously as
possible.

E. A. STUART.

Seattle, Wash

#### The Law of Magnetic Communications Between Human Beings

the Editor of the SCIENTIFIC AMERICAN: During his lifetime the late Andrew Lang as a ember of the Society for Psychical Research



Combined tie-plate and tie and one of the screw solkes

collected a great deal of valuable data as to comtions received by one person from another ed by vast distances, without the aid of telepraph or telephone.

well recognized that evidence of su It is well recognized that evidence of such com-nucleations must be well afted and weighted, because of the tendency to deception and fakery in dealing with such matters; but allowing for a large percentage of fakery in the evidence secured by Mr. Lang, the residue is of such a reliable nature as to make it reasonable to declare that the truth of such communications is well authenti-

cated.

Now, reasoning from analogy, such communications are not any more wonderful than the communications received over the wireless telegraph. In both instances, the force transmitted is the same -magnetic or electric; nervous energy being elec-trical in its nature, as demonstrated by those who triest in its nature, as demonstrated by those who have studied the nervous system; as shown by the effect of the electrical battery on the human system; of the galvanic energy transmitted through the legs of a frog. While we may trace the manifestations both of electrical and nervous energy, the nature of either force is mysterious and defies

Until Marconi discovered the secret, the law of utilizing electrical vibrations without wires was unknown. His discovery was simple in its nature, as all great discoveries are, i. e., the instrument creating the vibration must be in unison with the instrument receiving it.

instrument receiving it.

With this idea in mind, it will be found that
the incidents adduced by Mr. Lang occurred
between persons who were strongly bound together in unity of sain and thought at the time;
and while he does not impart this detail, they
must have been persons of a vigorous nature,
capable of storing and generating much magnetic ergy.

New, the law dissevered by Mr. Marconi was

not applied practically until some time after he had discovered the principle. I contend that with proper experiments, under the guidance of men of scientific attainment, a method will be found by which communication may be effected, at will, at any time, between human beings separated by great distances. The following, I beliave, is a crude statement of the law governing such communications. munications:

The person sending the message must be one The person sending the massage must be one strongly in unison with the person receiving it, and each human instrument must be a person of a vigorous and magnetic personality.

If this law our by demonstrated in a practical manner, as was Marconi's law, it will be of more manner, as was Marconi's taw, it will be of more importance to human kind than was Kepler's law of planetary motion, because Kepler did not enlarge the usefulness of astronomy by demonstrations of his law, as the epicyde theory of Ptolemy was just as good a working theory as Kepler's; but the practical demonstration of this law of the practical demonstration of this law of the practical demonstration of this law of communication will be of real use humanity. Two adequate magnetic personalities communicating between New York and Philadelphia, or even Chicago and Milwankee, would produce as much of a sensation in the scientific world as did the first successful communications over the

wireless telegraph. Scuddar Richardson.

Houston, Texas.

[The analogy between wireless communication and telepathy is not altogether complete. The wireless telegraph does not transmit thought, but simply signals which can be translated into an intelligible communication. Telepathy, on the other hand, deals with the direct communication of hand, deals with the direct communication of thought. Even the wireless telephone is not a perfect analogue to telepathy; for spoken words are but the equivalent of Morse signals. The

brain must first learn that a correan must meet tearn table seer-tain combination of lotters and sounds such as "water" means a definite thing. In telepathy brain responds directly to brain without the need of interpreting agnals or

We cannot agree with our correspondent that strong personalities are required to conduct telepathic communication. Instances enough to be found in the proceedings of the Psychical Research Societi of America and England as well as in many books which would seem ate that personality, in to indicate that personanty, in the sense in which our correspondent employs that word, has very little to do with psychic phenomena. Indeed, some psychical investigators even hold that we are all possessed

of us have not learned the knack of using them.



To the Editor of the SCIENTIFIC AMERICAN: In view of your editorial on "Research on Leprosy, appearing in the Scientific American of June 14th. appearing in the Scientific American of June 14th, 1913, there is inclosed herewith a copy of Public Health Bulletin No. 47, which contains an article on "The Artificial Cultivation of the Bacillus of Leprosy" On examination of this article, it will be observed that Moses T. Clegg, now of the Leprosy Investigation Station conducted by the Public Health Sovetice Surgeorded in grayment the Insurance healths:

Service, succeeded in growing the leproxy bacillus in 1909, and isolated it in pure culture during the same year. J. W. Kran, Assistant Surgeon General. Treasury Department, Bureau of the Public Health Service, Washington, D. C.

#### The Track Spike Problem

To the Editor of the SCIENTIFIC AMERICAN It is with great interest that I have read the articles relative to spikes for railway use. In your issue of July 5th I note a new idea, namely, that of the barbed spike. It has occurred to me that it would be a very difficult, if not impossible, matter to withdraw those barbed spikes from the ties after "the swelling of the wood by the rain."

It does not seem to me that we ought to say aught against the screw spike because train wreckers might unscrew it from the tie; could not those train wreckers,

with more case and success, use some powerful explosive?
"What goes up must come down," is an old saying.
We can revise that to fit the rail spike and say, "What goes down must come up

From my experience with the screw spike, I think that it answers the purpose better than any of the others. FRED. M. LASE.

Portland, Ore.



## The Japanese Battle-cruiser "Kongo"

#### The Most Powerful Armored Cruiser Afloat

THREE new battle-cruisers are now being built in Lapine—the "Hipte" at Yokoutka dockyard, to Harumi" at Koho, and the "Kirishima" at Nagasaki, while a fourth, the "Konga" has recently been completed by Messra, Vickors, Lid, at Rarrow-in-Purness, and will shortly be delivered. The strategical and factical qualities governing the design of these four battle-cruise, s having been enunciated by the Jay Navy Department from experience gained in the Busse Japanese war, it was left to this firm to embody the stipulated requirements. The machinery for the first of these battle-cruisers has also been constr Messes. Vickers, and she is now in an advanced stage of construction, having been laid down at Yokosuka dock-yard on November 4th, 1911, while the others were laid down in March of the following year. The vessels have the following dimensions: Length, 704 feet; breadth, 92 feet; druft, 27 feet 6 inches; displacen lons; service speed. 28 knots; maximum coal capacity, 4,000 tons, oil fuel capacity, 1,000 tons; shaft horse-power, 70,000; armament, eight 14-inch and sixteen 6-

buch guns; torpedoes, six 21-inch submerged.

It will, therefore, be gathered that the "Kongo" and

her sister ships are practically the same length as the "Princess Royal," but have each 3 feet 6 inches more beam, and 1,000 tons greater displacement, due to the greater fighting qualities laid down by the Japanese authorities The armament of the Japanese cruisers comprises eight 14-inch guns, as compared with an equal number of 13.5-inch guns in the British ship, an equal number (sixteen) of guns for repelling torpedo attack, but e of 6-inch bore as compared with 4-loch in the British ship. The "Kongo" has double the number of submerged torpedo tubes fitted in British ships, and as lu these they are designed to fire 21-luch White head torpedoes. Generally the that in the "Princess Royal," but owing to the introduction of armored bulkhends below the water-line, a greater weight has been absorbed for protection in the Japanese ship

The sight 14-inch come are mounted in pairs in four barbettes, two of which are located forward and two aft, all on the center line. These burbettes are arranged, and the elevation of the gun is fixed, so that four may fire forward and four uft, while all eight may fire ou either broadside. Notwithstanding the very powerful armament provided, the armored protection is most effective, particularly against tor pedo uttack The main broadside

armor is of special quality steel, and is equal in thick ness to that of any battle-cruiser yet designed, and is carried to the height of the boat deck, which is conthused on the same level as the forecastle, forming a citadel, into which the 6-inch gun casemates are worked. The male belt extends considerably below the waterline, and under this ugain there is an anxiliary armor belt extending some distance below the normal There is a special arrangem ormored buikhends protecting the vital parts of the ship; the magazines, for instance, being co rounded with special steel armor. There is an armored deck at the waterline level, and in addition to this there is an armored deck closing in the ship from stem to stern at the level of the top of the side armor

The water-tube boilers burn oil fuel as well as coal. the turblues are of the combined impulse and reacti-To insure safety, the bollers are arranged in eight compartments, four on each side of a center line bulkhead which extends throughout their cutire length. while the coal bunkers are also disposed to afford pro-tection. Again, the engines—two sets of turbines on four shafts—are arranged in two compartments, with a center line bulkhead between them. The whole of the arrangements preserve the independence of the port and starboard sets of machinery and allow either set worked when all parts of the other are disabled. The high-pressure ahead and astern turbines are of the Parsons combined ampulse and reaction type.

The full power trial of eight hours' duration was car

ried out successfully on May 8th, in stormy weather, a gale blowing most of the time. The de and the speed of 28 knots were exceeded. The designed por

and the speed of 28 knots were exceeded.

The gun triais took place on May 14th and 18th.

The gun-mountings are of the Vickers hydraulic type, The gui-mountings are of the victors advantactype, but have electric gear for use in the event of the bydraulic system in any way failing. In addition, too, there is a small hydraulic installation for working the guns when they have to be cleaned; but this gear will also serve, instead of manual work, for maneuvering the guns in the event of the main supply of power, either hydrautic or electric, giving out. Anothe ure of the installation is the application for the first e of the Jauney-Williams gear, which proved mos reliable and exact in controlling the turret movement ng motion or great speed being achieved with equal facility and precision. The most crucial test was the firing of the whole of the 14-inch guns and of all of the 6-inch guns on the starboard beam, making six-The firing was from the co tower and was absolutely instantaneous. It was re-markable that the cascades throws up by the first con-tact with the sea of the 100-pound shot from the 6-inch

The bow cradle, in front of which are the hydraulic rams for starting the ship down

as, suggesting a remarkable uniformity in the trajectory of the guns. The second contact with the water in the case of these shots coincided with the first contact of the 14-inch shots coincided with the first contact of the 14-inch shot, so that it was not then possible to distinguish between the 100-pound shots and the 14,00-pound shots. The salve represented a discharge of something over eight tons of metal, with a collective mustle energy of about 600,000 foot-tons. The effect on the ship was scarcely perceptible, so far as inclination was con-No damage was done to the ship's stre the only damage being to some of the lifeboats, the side planking of which was sprung. The performance was thus in every way an unqualified specess, and after the gun trials the ship proceeded to the anchorage at tireeuck, whence she left for Barrow-in-Furness on the following day, the torpedo trials being carried out on the way The "Kongo" is due to leave Barrow for Japan early in August.

#### The Visibility of Submarines By W. L. Catheart

THE submarine boat passed long age from the ex-perimental stage, and is now a definite and in-portant factor in the equipment of the navies of the world. On Deparable 18, 1812, there were belti, brild-ing, or authorized for the flests of England, Germany, the United States, France, Japan, Bunds, Estry and Austria. a total of 841 septembries, having an aggre-

gate displacement of about 181,000 tons. White the green in the effectiveness of these boats has been rein tively swift, two comparatively recent improvement. virtually doubled their powers of offer to the unvarying accuracy of the groupout complete the location of the ship to be attacked can be observed at a distance of eight miles, and then the book was run fully submerged to the exact point where, after run runy successed to the exact point where the final sight, the torpedo is to be discharged, the effective range of the torpedo itself has be creased to 11,000 yards by the use of turbine e creased to 1,000 yards by inc use of turbune engines having superheating apparatus in the pressure current. With such range and accuracy and with its ability to strike below the armor belt at the very visals of the ship, the deadly power of the submarines, in so far as qualities are concerned, cannot be question

The development of aviation, however, threats The development of aviation, however, threatens to affect injuriously the offensive power of the submarine in its most essential characteristic—invisibility. Since these boats are both relatively slow and unitrasted, they must be submerged when approaching the skip to be attacked, and hence they must depend on submarg-ence for both their invisibility and their invinerability. This submarigence, however, will ap-

parently no longer save th view, for, in future naval actions, all large vessels will carry sero-planes, and the aviator, souring on high, can readily detect the su rine heading, below the surface of the sea, for its quarry. When Bi6riot made the first flight across the English Channel, he saw near the town of Deal two tornedo-boat destroyers followed by a long line of submarines, the latter being fully submerged and invisible at sea level, but clearly discernible to him in his monoplane. If he had been an aerial scout in actual service, he ld at once have reported the m marines by signals or wireless to els which they were about to attack.

Since then, numerous other aviators have had similar experiences. During the review of the British fleet off Spithead last fail, submarines were thus detected by aerial observers; in maneuvers in Chess. peake Bay, our scouting aeroplanes discovered the under-water craft, without the ald of giasses, althou the boats were at a considerable depth below the surface; an Italian aviator in Tripoli saw on the bottom of the bay the charred wreck of the old United States frigate "Philadelphia," which was burned by Decator in 1803, after her capture by the Algerines; and very cently Lieut, Bakoppios of the

centry labelt. Bakopulos of the Greek navy observed on the reefs called Pharos Rank to the eastward of the island of lemnos, at a depth of from five to twenty-five maters, the roins of an ancient city which long ago sank be-

In military aviation, it has been found that a trained observer at a height of one mile can distingu tween troops of the various arms on the earth below, so that so far as clear vision of the scene beneath is no that so har as clear vasion on the receive butterns, we construct concerned, man seems now as capable as the souring eagle or the carrious birds with their dan-placeting game. Further, the eye at these Frest bigints is able & penstrate the mask which, at the surface, hides the depths trate the mask which, at the surface, hides the depths of the son below. There are two reasons for this virtual invisibility of these depths to the unaded, spe of son-level. We see an object by the light resident shown it, and, as the surface of the water reflects much of the light which strikes it, but relatively little page. the light which strikes it, but relatively little some trates below. Hence, the depths are dark as companied with the wuntit air above, Amin, the resteemed light at the surface dambes the eye of the observery and pre-valus it from receiving such rays as six elementaries from a submerged object. Many despois Saison here globalist, profuberant eyes, as shaped at no justice the last ray of dim light about them. To one out surface restertion, spoup shaber looks through the "reace tea-cope," a box without a top and having a place heatens, which they shak about half with place for smaller. The "Differ water gloss," a distribut appairing in its small behavior of the company of the companies. The

of vertical rays is zero. As Section of removed, the spectrum of the observer from prices, the less the light will be reflected and the will be the amount of vertical rays received by.

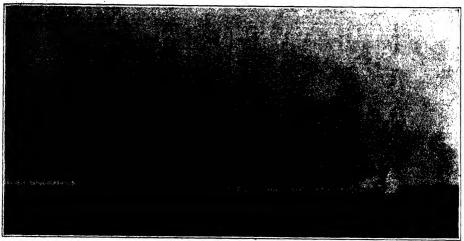
the eya. Again, as has been noted, surface reflection dandes the eye and interferas with the direct rays which otherwise would reach it. By rising to an ait-tude at which the reduced light is virtually sliminated, as detthe case of the acropians, the eye receives only the direct says transmitted from objects besuch the

surface. From these considerations, it seems clear that, in see water of nermal translucency and at its cruising depth in war, the invisibility of the submarine to an aeropiane lovering above it is a thing of the peat, except at night and in loggy weather. These conditions have been recognised fully by naval experts. Last September, Capt. Washington I. Chambers, U. S. N., now in charge pet haval station, in a report on the subject to the Bureau of Navigation, specified, as one of the contem-

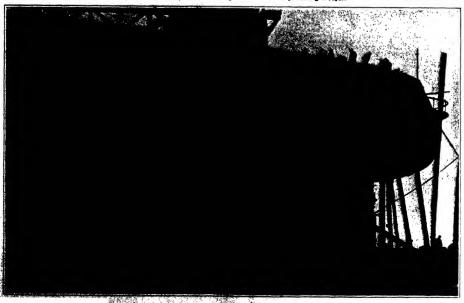
plated uses of aeroplanes in naval warfare, "to locate patted uses or aeropanes in nava; warrare, "to locate and destroy submarine miles, submarines, and dirigibles, and to assist in the operations of submarines and torpedo boats." While the visibility of the submarine miles to an aerial observer is another story, we may mine to an serial observer is another story, we may note in passing that, if Makaroff Snagalin, in its sortie from Port Arthur, had been preceded by a scouting acroplane, the mine which sunk her would have been discovered long before she reached it, and the galiant admiral, his crew of a thousand men, and his great ship would have been saved from the swift destruction which they met.

The fleets of the air seem at present then to be fully capable not only of leading but of attacking, more or less effectively, hostile under-water craft. When it is

(Concluded on page 134.)



gth, 704 feet. Bonne, 93 fort. I ss Eight 14-inch; sixteen 6-inch. Terpe se battle-cruiser "Kongo." Three sister ships building in Japan.



#### Boots Ripped by Lightning

The boots shown in the accompanying photograph were worn by Mr. John M Carns of Provincetown, Mass., on June 2nd, 1862, while he was in his boat fashing. A thunderbott struck the man and rendered him uncouncious for several hours. One burn ottended from elbow to wrist. Another burn rau from the neck to a Joint low down upon the back. The worst burn wis on the right leg. The boots that Mr. Carns wore were practically new at the time. The lightning ripped the soles from the upper, fore apart the seams and reduced much of the leather to rags. The victim spent six weeks in the Boston City Hospital, where the doctors offered to cancel his Mill of 800 in exchange for the boots, but the owner prized them too highly and kept them until his death, at the ripe age of 92

#### Belgian Sand-boats

THE introduction of the sand-but has relegated to the rear all other spects at the Belgian sea-side resorts. Whitsing by, at almost the speed of an accopiane, these fragile beats, mounted on four bleycle wheels and displaying a great main-sail, bellied with the strong wind from the North Sea, present a picture of pleasing novely.

The Belgian coast, from the bordaring French town of Dunkirk to Plushing light-house, the first landmark in Holland, is an unbroken stretch of level sangly beach. Lotted at latervals of from two to four miles are Zacabutating resorts, buttle upon the famous said dunes, for which Belgian is so noted From La Panna, Cozyde, Oostenkirk, Nieuport—mil the way to the important city of totends, and still farther on, to the favorite see-side town of Bianksenberghe, these white-winged sand-boats are sent out to compete in the races, up and down the const. As the yield sold sabitas, these contests are of almost daily contributed.

Pleasure-seekers galore gather to choer the boats from their respective reserts. On a fine day, the eather stretch of sauds is an unbroken line of moving humsnity. Children on donkeys, led by contumed personal girk who patter their bare feet over the smooth, wet beach, shell gather-ers and lide strollers—all of thein turn to rinor plantom-like hosts, sweeping alreast on insoft—the pennants of America as well as Reigitum futtering from their masts. Sailing it on a hurricane gale or plowing their way through a sand drift, hurling the glassy particles abidt, as a cloud of spray abeam, the passing of these boats for the signal for a spontaneous cheer that accends and floats away across the sea, only to be echoed back, as a signal of the approaching race, to those persons farther up the strand.

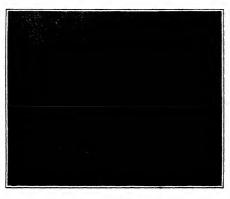
#### Canopied Skylights

I N the south court of the United States A Treessure Building at Washington, D. C., there is a one-story building about 32 feet square, considering of a center parton about 39 feet wide by 92 feet long, and two side wines each 10 feet by the same length. The side buildings have sloping roofs, in each of which are placed three skylights, and a ceiling in which are placed ceiling lights under the skylights, thus formlug air chembers.

Over a large portion of the matu rsom are two "saw-tooth" skylights, which open directly into the room with no celting beneath. There are also two rows of small skylights in the roof over the large room. These small skylights, together with those over the side buildings, are stielded by rolling canvas curtains on the outside, arranged in sections. The tincovered slophing portion of the "saw-teeth" are shielded by fixed canvas curtains over which water is allowed to trickle, the object being to keep the tin roof as cool as possible. These canvas curtains are pinced for enough above the tin to allow a free circulation of air under them and are partially supported by a 3-inch galaxy cantide from play at the ridge of seal sky-vanised from play at the



Havoc wrought by lightning to a pair of boots.



Sand-boat at a Belgian sea-side resort.



Building a boulevard over a sewer



Wet canvas canopy for the United States Tressury Building skylithin.

light respectively. The since is acceptant with one row or Alforium those, spaced about a foot apart. The center the through the holes is so set that the jest it water shall strike the naives as high as most the

Thermometric readings taken show that while the beapercture on the argused tin roof outside of the onlyes is, often as high as 128 to 127 degrees, and the beapercture in the dry shade on the issue roof at the same time is 80 to 188 degrees, the temperature of the tin under the wet canusa is zoon 78 to 83 degrees, and the temperature of the room below at breathing line is from Si to 87 degrees, when the temperature of air in the shade at ground level is 80 to 92 degrees.

### A New Copper Photographic

PHOTOGRAPHS upon copper plate are new made by a new process. It has been desired to use the sensitiveness of cuprous salts to light, especially for transg engraving design such images could not be fixed, as reagents dissolve the copper salts, both acted on by light or unaffected, in about the same way. By a new process, a polished copper plate is exposed to chlorine gas for copper plate is exposed to choose gas to a few seconds to produce a sensitive layer, then it is exposed under a negative for ten minutes in sunlight, after which a positive image is seen. The sensitive lay-er should be extremely thin, as a thicker layer is less suitable and is found to be in some cases twenty times less sensitive. Fixing is readily done by a toning-fixing bath containing but little hyposulphite and already charged with silver saits coming from previous use with paper toning. On the plate the affected parts take a brown hue and the rest dissolves out. Other baths can also be used. The image made dagnerrectype.

#### Building a Highway on a Sewer

JONER FALLS, often called the dirtiest sower in America, which has failowed a singleh, devious route through the city of Baltimore ever since it was founded, is being converted into a splendid benievard which affords an easy-grade highway from the outskirts of the city to the harbor's edge. It is called the Fallsway.

Calvin W. Hendrick, chief engineer of the Baltimore Sewerage Commission, conceived the plan, and after a long and disheartening campaign against conjectvative elements in the city, secured the approxiof a million-foliar loan for the improvement. Work was begue immediately. The plans prepared by Mr. Hendrick provided for three conduits, each 20 Seet wide, of concrete, and paved with vitrified brick, to be eracted issivener the relating walls of the stream. Over these a roof was designed, which when coverand with g filling of earth, and paved, would form the street.

The cent conduit was made deeper, and through this the wester will flow under options; conditions. In times of stora, the gates will be opened, and the shool let into the middle phanther. Only in great floods will the third couplet be encountry. Jones Falls has a repetation for disparitous floods, part has frequently overflowed its banks.

nowed its banks. Chief among the many and perplanting problems met to constructing the Fallsway was a great horseeinch good which Air. Hendrick wished to die away with. A tunnel was thereforce efficiel through earlier diversity diversity and the system diverted through it. All the waste hand bordering the hend of the horseebne was thus reclaimed into valuable laint. Out many the borderine of the bitty, the desarted of the street in any fact helms the borderine of the bitty, the desarted of the Spacking of spaints limit. Out many the borderine of the bitty, the desarted of the Spaints of the bitty, the desarted of the Spaints of the borderine of the street, and the street of the desarted of the Spaints of the borderine of the Spaints of the desarted of the Spaints of the Spain

### Inventions New and Interesting

Simple Patent Law: Patent Office News: Notes on Trademarks

#### New Electrolytic Alkali Cell By John B. C. Kershaw

EVERAL years ago Dr. Jean Billiter of Vienna inA-yeated an electrolytic alkali call combining the advantages of the disphragm with the boil gravity type.
Since the patent on this cell was secured, it has been
theroughly bested on a practical industrial scale in
Germany and Austria. At present there are five works
in operation where this cell, known as the Billiter-Sietenses cell, is employed, the most important of these
being the Niaparra Alkali Company. As described in
the patent specification the cell consists of a bell if
(Figs. 1 and 2), which is closed at the bottom by a
disphragm 2. The latter rests on an iron or nicket wireunt 8, which serves as the magnitive electrods. The
boll stands in a vessel 10. In the inside of the bell
is the anode 8, made of pintinum or certon; this is
placed parallel to and at a short distance from the
exthesis wires 8.

In order to permit of a complete separation of the products of electrolysis (wood as pean choicetes), the eef is operated as follows: The bell is filled with the eef is operated as follows: The bell is filled with the eelst object to a predetermined height, while the option of the product of the third works through to the cathods, and forms, there, sodallys. The contest is the product of the lyes in such a position and of such dimensions, that the liquid in the onter ressel just washes the cathods whereast. In order to allow easy sait for the hydrogen bubbles evolved during electrolysis, the cathode wire-not (Fig. 1) may be curred, and may be silowed to abut against impervious channels of having openings allowing the hydrogen to escape easily; or the straight or corrupated exthode wire-not follow sufficient for the purpose. In order to raise its conductivity, the electrolyte may be warmed by a beating pipe, not shown in the drawing, and the apparatus only works well when suitable dispuragus are used. The desired result has been obtained in the Billiter cell ty works well when suitable dispuragus are commercial ashested coloth I (Fig. 1), on which is agreed a special powder displaying 2. According to the invention, a displayment overson, and the surface of continue to the train substance of coloth as from a maximum or beating another or alumina with a substance wood, and this is made into a pleasite, but tenecious and consistent means, with a suitable dispute on a continue means, with a suitable dispute of the means, with a suitable of courter of the means, with a suitable of courter of the means, with a suitable dispute of courter of the means, with a suitable of courter of the means, with a suitable dispute of courter of the means, with a suitable of the means and the suitable dispute of courter of the means and the suitable dispute of courter of the means and the suitable dispute of courter and the means and the suitable dispute of the

mass, with a solution of common sait.

These disphragms are stated to be extremely resistant; they will keep for months or years, and can be quickly and easily changed or renewed, as compared with the ordinary powher disphragms. It is only necessary to remove the layer of mixed sabsetos wool and powder and to substitute a new layer; this can be done in a few minutes. As an alternative the subscise cloth may be taken out, a new one put in, and the disphragm made up again. In aft, these disphragms after a short time, dry completely and become hard; they recover their original plisability and permeability on being placed for a short time in water, or in a sait anoutton.

paces no ex anore time in water, or in a sait soutron.

During the electrolysis, sode, by is formed in the vessel 10, while chiorine loss base to the anode, are then
collected, and are evoived as guessum chiorine. Fresh
solution is added through the pipe 12, which extend
down aimset to the disphragan. During the electrolysis
down aimset to the disphragan. During the electrolysis
forms and the proper part of the solution becomes posin said, and though the processor in specific grantity; as a result of this difference in specific grantity; as a result of this difference in specific grantity; as a result of this difference in specific grantity; as a result of this difference in specific grantity; as a result of this difference in specific grantthe strolumny.

the displiragin.

The cells may be finde of various materials, such as wheeglass, or stoneware plates bedded in coment, or asphalt, as shown in Fig. 1; they can also be made of ammored concerts or of stone alsob. In small cells (up to 100 amperes) it advisable to fix the salestoc cloth cat he ball. The whole bell with the displiragin can than be placed on a corrugated wire-not, shaped to the form of the outer vessel. The bottom of this outer vessel 1.0 is advantageously made of sheet fron, and it these forms the needfactor for the current to the exchange set. In larger cells (above 100 amperes) this plan is scarcely practical; and in quick cells it is advisable to states the exchange when the cathode wits-put to the ball. In order easily to vision the displaragin, it required, withey having to stake out the ball, the lid of the latter is pade readily reinergylable.

The experimental trials with this coil gave a curcut differency of trees 50 to 60 per cent, with a conceptant of trees 50 to 60 per cent, with a conceptantian of single-ty- of 15 per such, and colorine gas 6.49 per such party, on his pulsant escapionation, the factoring states that conceptanting up to 30 per cent and 15 per cent NaOH can be obtained, and that a cell with a cathode surface of 1 square meter when worked at 60 deg. Cent. will take a current of 600 amperes with so E. M. E. of onte 4 to 444 vote.

The claims made for the new cell and process are:

The claims made for the new cell and process are:

That it combines the advantages of the earlier diaphragm processes with those of the bell gravity cell, and that it overcomes the client defects of both.

That the causes of low efficiencies in the open type of beliceliar acchecked; (a) by the presence of the diaphragm; (b) by the stretched or the fluores in the cell; and (c) by the direction of the fluor of the electrolyte through the cell. These three conditions enable one to obtain a comparatively high current efficiency

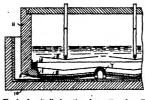


Fig. 1.-Longitudinal section of a portion of a cell.

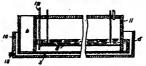


Fig. 2.—Cross-section of the alkali cell.



Fig. 8.—A battery of alkali cells in Krumman, Bohemia.



Fig. 4.—Perties of a cell room at Aschereleben,

(for the type of cell) with a fulrily concentrated solution of sodium bydrate at the eathode. The fact that the disphragm is immersed in sodium by drote solution, also contributes to its long life, and reduces the running costs of the process.

#### Notes for Inventors

Lactic Acid and Mait.—Robert Wahl of Chicago has secured patent, LOSS/GN for the addition of tactic acid to mait during a stage of the manufacture. This he does by means of a liquor containing a culture of lactic acid hacteris. It is claimed that the added lactic acid lends zear to the beer and exerts a stimulating effect upon the peptase of the mait.

A Retary Safety Razer.—George Nichols Moore of Dumoni, New Jersey, assignor to Rodary Appliances Company of New York eltj. In a patent 1,006,008 presents a safety razor which has a blade of disk form with a continuous cutting edge rotated by suitable means in juxtajosition to n guard, means being provided for varying the space between the guard and the cutting edge of the blade.

A Mergenthaler Linotype Patent,—Patent 1,067,503 to Mergenthaler Linotype Company, as assignee of Charies C. Burdine of Washington, D. C., presents in a typographical machine, transfer menne constructed to receive successively a pinrailly of separate lines or the sections and to forward them simultaneously, together with means to deliver them in assembled form successively to the transfer nears.

As Improvement in Lace Manufacture.—John E. Dudson of River Point, Rhode Island, assigner to Harry C. Chrits of Warwick, Rhode Island, has secured parent 1,047,324 for lace and process of making same in which the lace comprises wearings of three or more colors in a single longitudinal strip. The invention provides for wearing lace curtains, embrodery braids, lace edgings and insertings with any desired colored pattern of three or more interchangeathic color.

A Sectional Lifeboat.—Benjamin F. Sargeant of Fort Worth, Texas, has secured patent 1,007,276 for holding and launching machinery for lifeboats, also patent 1,007,277 for lifeboat. The patent for the life-boat above a lifeboat of two sections which fit side by side and are hinged together at the bow so that they can be opened out end to end when on shipboard and can be folded together to form a shigh boat. Each section is provided with a propeller and with an engine for driving the propeller.

An Astomatic Stabilizer.—Norman Clark and Albert E. Plank of Quincy. Himbs, in patent LOTT-900 present an acropious which has a course curred lower surface didpent to the front edge of the plane and extending back beyond the middle of the holy of the plane and exceeding the conceave surface adjacent to the pear. Thus they seek automatically to multitain stability and equilibrium in secondance with varying degrees of speed and atmospheric density and to avoid stability.

Improving the Patent Office Building.—Some recent and five or first attracted intention to the defective electric light equipment of the Patent Office and have led to the lindulation of modern wiring systems, and Ar the same time the main or rank line sweers in the besencest of the building are being extended to meet the horrowed demands and to modernize the building in this respect. New flooring has been lated in most of the examineer rooms and a general thouse-clonning is in magness. The building of the completed when the new Commulation, Mr. Eving, meaning office on August the complete of the complete of the complete special definition as Pirac Assistant Commissioner on Sepponds duties as Pirac Assistant Commissioner on Sep-

Two Patents to Charles Francis Jenkina.—Charles Francis Jenkins, the well known Washington, D. C., inventor, has had besued to little two patents, on No. 1, 097,631, for a marchine for applying caps to bottless of paper or other unsterds, and another, 1,007,432, for an improvement in dying machines, which latter includes a frear steering vane. Heretofore in a Wright machine it has been usual to pull down the rear edge of the main piane or of the nilerons or batanchy planes on the low sides of the machine when it has best its equilibrium, and to let go the other side. This has a tendescap to throw the machine around off its course, and to counteract this the rear rudder is so counced as to be simultaneously moved to neutralize this turning effect.

### RECENTLY PATENTED INVENTIONS

These columns are open to all patentees
The notices are inserted by special arrange
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tion to the Advertising Department of the
Scient r c American

#### Pertaining to Apparel.

Pertaining to Apparel.

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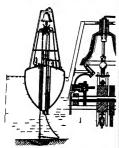
Of Interest to Parmers.

(OHN MISKER - G. A. RETENS 520 (c. tr. P. Bligh. III bils invention comprehends a husting device. I wile he haven to see ke to ak verious in provenest relating more especially to the anner in while the hasks are removed from the virs aid 1 wt ? I deats are separated from the stalks and

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#### Of General Interest

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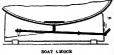
relates to a device for se and comprises means for its adaptation usefulness in the draining and drying of rainy day — the wet unbrella Means tho



SUSPENDING DEVICE FOR UMBRELLAS

rel a to engage or hang on the edge of a sh if door I fact anywhere to drain from th points of the bows. The engawing illus-trates the outer end of an umbrella showing on of ti suppending devices detachably se-cured thereto.

R AT (110 K -- W S Roussa Box 59 New port R I This invention has particular ref er nec to means for supporting life-boats upon le ks of vessels in connection with the neual davits or for supporting any other kinds of



boats The out support or chock is of a peculiar natur wherebr a life-boat for ex a ple nay be operated from the dayts and naily and qui kiv lowered to the gunwais without th n saity of fart hoisting the boat in ord r to clear the chock or enable any per lou of the chock to be removed from normal

position

Si OOL BEARING —J E Nacz 11 Carlesie

St II a ver Ia Bearing sockets comprise
semictrular n u ers with ends ther-of in
the forms of spurs integral with the body of
the socket the naterial being best diagonally
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tle y right angles at points inward from the



disg nsi lin s the ends of the bearings thus pres oring return beat members and members beneath the return beats the gapar projecting the present of the return beats the gapar projecting partial properties of the socket apprainately parallel with one another and with the axis of the socket. The invention relates more particularly to means for supporting spools in cubiness adapted to display lace and inserting.

Monroe, Ind The fastener has twe elongated members, one with an opening in its outer end, and the other with an attenuated inner end, and the other with an attenuated inner the opening the members intig in light-lock ing oungament with sade other at the agent hand and opening, each member having a house at ins other end or engaging a notwepter with the contract of the other contracts of

#### Household Utilities.

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MENUGW SHADE FIXTURE.—A. DAVELO

MINDOW SHADE FIXTURE.—A. DAVELO

AND LE RESON, 175 CHIMNE SE RECORDY N. Y.

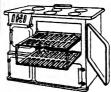
The invention provides runways for the edges
of a window hade to protect and guide the
same as raised and lowered and in service
scape of shades and the consequent excessive
rolling of the automatic stitchment and provides means for arresting a shade in its flight
without damage thereto

DEVICE.—Pus

CULLA LAVERSE OF IN NICOLOGY

N. Y. The purpose here is to provide a device
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ing the window passe on the contact three
hy the operator manipulating the device from
the inside of the window

KITCHIEN REMINIDER.—F A BRETAM
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WITH DRAWING BAFETY OVEN

entirely outside of the range the open sides, end and top nake it easy to put the cooking in place do all turning basting and finally re noving all from the oven without danger of unring hands or ar s A when thesi shield full size of the oven and attached to the rear of the skeleton coupling in the opening and recting the oven and attached to the rear of the skeleton oven it withdraw in at while, the skeleton oven it withdraw in a transparent o

#### Machines and Mechanical Devices

Machines and Mechanical Berices.
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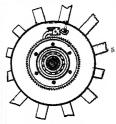
Railways and Their Accessories,

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# All controls at your hand



ROM the small compact control box of the Aplco electric equipment you can start your motor, switch lights on or off, dim your head lights You can lock starter, lights and horn, test flow of current, light your dash

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hen you buy your new car demand an Apico starter Write us about it. You want to know what you can do with this starter problem, anyhow It's the most important accessory you have

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on of French and Gern Strongth in Dirigible Airships

(Concluded from page ISE.)

If the actual status of this aerial fleet
is secret, that of plans and projects is ably so French inferiority is obvious and also French efforts to dimin

trike a proper balance between dirigibles and aeroplanes the great merits of dirig ibles—their radius of action and ability out at night—with their immense de —fragility difficulty of taking on stores and charging hazardous landing et etc must be con

We must not forget the terrible series of estastrophes to which nine of the great dirigibles have succumbed nor the result ant financial loss not what a correspond ing sum might do for us if applied to

viation says our French contemporary The remainder of the article deals with other countries.

midable fleet of dirigibles that is gener ally supposed, and may be considered a the third air power in Europe The mili tary school of aeronautics alone has five dirigibles. Besides, there have been or directions. 10 000 cubic meters with a speed of 60 kilometers per hour built by the National Iorsky factory the Astra XIII (French) and the 'Clement-Bayard VI which are now having their final tests (9 600 cubic meters 260 horse-power 13.5 meters diameter total length

ITAIT -Up to last year Italy had only five small dirigibles ( P1 P2, P3, P4 "15, of 4,500 cubic meters capacity F4 "15, of 4,000 cubic meters expacity and 50 kilometers per hour speed) But she has recently built two of 12 000 cubic meters capacity (Mi "M2) and the M series is to be continued with M3 M4 and M5 having the same characteristics 1. a. the remarkable speed of 70 kilometers per hour an ascensiona of action of 1 000 kilometers engines of 500 horse-power and ability to stay aloft 35 to 40 hours Italy with its five factories at Rome Milan, Campalto Verona and Bracciano is trying to create a pow erful serial fleet

building at Ferrara.)

A third series G whose construction has been decided on and of which the first will be ready this year will equa-(24 000 cubic meters) and surpass them in speed (100 kilometers per hour) if the plans of Forlanini and Major del Fabbro work out as expected The engines pro-vided to insure this sensational speed are of not less than 1000 horse-power (A ned Citta di Milano built at Baggio of 24.000 cubic meters capacity signed it is said to undertake the cross-ing of the Atlantic In short the Italian construction is sufficiently remarkable for the German officers to be following its

AUSTRIA HUNGARY -- Austrin which has AUSTRIA HUNGARY—Austria which has had no actival fleet, has recently tried to acquire a Zeppelin from Germany but Count von Zeppelin has publicly declared that he will not build vessels for any other country than Germany

ENGLAND —At present England possesses no dirigibles of great tonnage Its small dirigibles are remarkable for their in distributes are remarkance for their in genlous mechanisms notably the oriented propellers. The British Admiratry has just ordered two dirigibles of 10 000 outher maters capacity making at least 65 kilom-eters per hour One will be of the Astra, Torres type, the other of the Parse

Torche type, the other or the world, the linky "a more bainhor not suspended from a gas-filled envelope and carrying a motor of 35 heres-power only belongs in Ragiand It accessed 80 Historians used hour. Its adjustant value is questionables. The given area distinguis "Marky" was desired as a first of the control of the



# **Symbols** of Protection

Ancient Egyptians carved over their doorways and upon their temple walls the symbol of supernatural protection, a winged disk. It typified the light and power of the sun, brought down from on high by the wings of a bird

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the information given cannot be considered rigorously exact. They fix with pre-cision, however, the respective strength of the air forces of the different countries,

#### The Visibility of Submarines

(Concluded from page 129.)
remembered that the submarine is un

stively slow, that in war its craising depth and that at which it must attack do not exceed the draught of must attack do not exceed the granget or a intitleship, that acrophanes can readily overtake it, hover over it singly or groups, and deliver a flood of missiles on its buil, perhaps before their presence is known, the lattie, for the under-water terror, seems unequal. If warned in time, its only recourse is sudden and deep div ing, like a fish fleeing from the talons of a hawk. With its low speed and the pow-er of the aviator to scrutinize a wide area, the duration of these tacties seems limit-Aeropianes working in conjunction with tornedo-hout destroyers in attack of rines would seem to the old sailor much like that most sauguinary traged; of blue water, the assault on the helple whale by the sword fish and that wolf of the seas, the thresher, in which the mis-siles of the aeroplane would take the place of the thresher's savage blows.

se adverse conditions submarine is far too powerful and deadly a weapon to be eliminated from naval warfare. At night or in foggy weather, it is wholly safe from aeriai en under these sheltering screens, it can still feel its way to its target, while, if duty called, there will always be plenty of brave men afloat who would dare the dangers of the sunlight to steer it to attack. Finally, when we review the swift progress in the enginery of war ou the sea during the last twenty years, it seems impossible that the genins of inventor-will not find a way to conserve the submarine's fighting value, either by protecting it from its aerial foes or by enabling it to meet them on more nearly equal terms The problem is doubtless engaging the earnest attention of usvai experts.

#### John Milne

THE recent death of Prof John Milns removes from the English scientific world one of its most conspicuous figures if not altogether the creator, Mine was at least the carliest lender of the "new eismology;" i. c., carthquake-study as a branch of physics, rather than of descrip-

tive geology Milne began his career as a mining engineer, and after a good deal of wander-ing over the earth in that capacity found anchorage in the little colony of scholars and experts who were engaged in imparting occidental knowledge to the newly awakened people of Japan. He begun a twenty years' residence in Japan in 1875. twenty years' residence in Japan in 1875, when he was 25 years old. Here, as he has blauself expressed it, "they had earth-quakes for preskfast, dinner, and supper, and to sieep ou," so that his curiosity could not fail to be aroused by this obtrustive phenomenon of nature. At length, in 1880, a particularly disastrous shake inspired him with the idea of organizing the world's first society for the study of earthquakes—the Seismological Society of Japan. The pioneer work carried on by this organization placed the science of seismology on an entirely new footing, especially since it included the develop ment of the first accurate lustraments for recording and measuring earth move-As honorary secretary of the s ciety for fifteen years. Milne was its lead ciety for inteen years, billie was its seat-ing spirit. He early recognized the im-portance of erecting seismographs and seismoscopes, at as many places through-out the ceunify as possible, and before the end of his tenure of office in the Orient he had created a Japanese network of 900 statious-a far greater number than are

stations—a rar greater number than are is combined a number of successivity found in any other country.

In 1886 Frot. Milne with his Japanese white returned to England and took up his abode at Shide, in the Isle of Wight. In this quiter retreat he continued his chosen work, but new with a broader outlook, for each less which machines for starting the operation work, but new with a broader outlook, for each less which machines are to the machines for starting the operation work, but new with a broader outlook, for

he soon set himself to the task of organis ing, on behalf of the British Association for the Advancement of Science, a seisogical survey of the world. The need of an international organization had be of an international organisation and be-come apparent with the discovery that strong earthquakes make themselves felt all over the globe and cannot be ade-quately atchied merely as local phenom-ena. At the same time he wurked hard at the improvement of seismographs, with a view to providing an ideal and uniform squipment for the international stations. The great memorial of his activities since 1866 is found in the series of reports of 1895 is found in the series of repo the Seismological Committee of the British Association, of which he was and prime mover up to the time of his

#### The Death of S. F. Cody

COLONEL S. F. CODY, an American by birth, but a naturalised English sub ject, a figure long prominent in the world of aeronautics, came to a violent end on August 7th. He and a passenger named Evans were killed while flying in Cody's monoplane at Aldershot. The cause of the accident could not be ascertained; for the muchine dropped from a height of two hundred feet and was reduced to a nam of tangled wreckage

Cody was first heard from as a design er and builder of kites. So successful was he in his province that his work attracted the attention of the English military authorities. In his very original investiga-tions, he succeeded in towing boats though the water with the aid of kites and even made the attempt to cross the English Channel in that fashion. In 1905 he succeeded in elevating a man to s height of 1,133 meters by means of kites

The construction of the mechanic tion of the British military divigible "Nulli Secundus I" was of his design.

Cody was one of the ploneers in avia tion. In 1909 he constructed a biplane with which he flew 420 meters on Max 14th at Aldershot. After various mis-hnps, he succeeded in making long flights by the end of 1909. Indeed, he was one of the first of long-distance ilyers. As early us August 9th, 1900, he covered, 75 kilom eters and came down only for lack of fuel On November 4th, 1910, he covered 110 miles in two hours and twenty-four min utes. With an improved biplane of his own construction, he took part in the English circuit of 1911, but without accompiishing anything wonderful.

Cody had entered in the London Dails

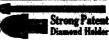
Mail \$25,000 prize race around the Brit ish coast, and for this purpose had con structed a new hydro-biplane with a span

#### The Current Supplement

THE volcanic character of the Japanese Islands raises altogether peculiar problems in building construction. How these are met by scientific methods is told us by Blackford Lawson in the current issue of our Supplement.—Prof. O. W Richardson furnishes experimental proof tint the electric current in metals is carried by electrons.—B. Thieme de the production of impoblack by electrical precipitation. -- D. A. Wiliey tells us of the heroic work of the English army medical service in combating that scourge of Africa, the sleeping sickness.—The Schoop process of metal-coating surfaces is described by Dr. Lach,...J. A. Hill tells m some remarkable facts about that mysterious aspect of the human mind, the subliminal or subconscious self.

A Combination of Speech - recording Devices. — Franz Ewald Thormeyer of Hamburg, Germany, has secured a patent, No. 1,083,085, for an apparatus designed for the recording and reproducing of lengthy speeches and compositions in wi ivels





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cord Cross-Country Flight with an American Military Monoplane

FIER having thoroughly tried out his machine at the Hempstead Aerodrome Mr. C. Murvin Wood made a record longistance flight from that field, located ear Garden City, L. L., to Guithersburg, Mid.—a distance of 225 miles—on the 8th ast, Mr. Wood intended to fly to Fort Meyer, Va., but he was unable to arrive there because he lost his way, and also because the motor failed him. He eventually landed at Fort Meyer at 5:45 P. M. of the same day, however, The start of the flight was at 4:30 A. M.,

simultaneously with the start of a special

train over the Pennsylvania lines from Jersey City. Wood rose to an elevation of about 3,000 feet while traveling to Belmont Park, and thence out over the Atlantic Ocean. Only when his motor stopped and he descended about two thou-sand feet, was he able to discern the sea beneath him through the fox. Forunately the motor re-started again, and, by ately the motor re-starred again, and, by turning to his right, he was able, only however after ten minutes had elapsed, to regain the shore at Coney Island. He must have been fully ten miles out to sea. must have been tuily ten miles out to sea. Without loading his nerve, he steered across New York Bay and crossed Staten Island, entering New Jersey near New Brunswick. Fallowing the raitroad, he passed around Trenton at 6:30 A. M., and continued southward, circling around Philadelphila he for any the results of the state of the delphia, as he feared his engine might ston The special train stopped at Philadelribia a half hour to ascertain Wood's whereabouts, and Wood passed the train during this time. From his time of passing various points the men on the train estimated his speed as from 58 to 63 miles an hour, and aithough the train made rer-ord speed to Washington, frequently traveling over 90 miles per hour, it seemed impossible to catch the fleeting seroplane. linon arrival at Washington, the occuupon arrival at washington, ine occu-pants of the train found that Wood had descended at Guithersburg. Wood's me-chanic was taken to him and repaired the engine. He found the trouble was faulty iguition. Wood reached his greatest ele-vation-7,350 feet-ut Havre de Grace. Md., but from this point his engine began missing badly until it finally stopped com pletely after he had descended gradually to about haif the above mentioned height. A southeast wind had drifted him toward Putomac River and follow this southeast to Washington. It was with difficulty that he could discern the railroad tracks, which looked like threads, and he lost these sitogether after circling around Baltimore, which city appeared as a black smudge below him. With 25 gallons of fuel in his tank at the start. Wood imd some 4 gallous remaining after his 4%hour flight. Nevertheless he obtained 5 gnilons extra from Fort Meyer, and, starting at 5:30 P. M., he covered the remaining 20 miles to that point in a quarter of an hour and voluinned from 6.000 feet in two graceful descents until he landed upon the parade ground. The machine is to the parade ground. The machine is to be given special military tests, after which Wood may return by the air route to Hempstead. It is noteworthy that this machine, known as the Kantuer-Molsant monoplane, since it was designed by Harold Kantner and constructed by the Moisant Company, worked perfectly throughout this long flight, whereas the failure of the 50 horse-power Gnome momanure or the BD horse-power Gnome mo-tor was the cause of the descent before Fort Meyer was reached. Until an abso-lately reliable aviation motor is produced cross-country flying can never be accom-plished with absolute certainty.

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# Notes and C and Queries.

Eindly keep your queries on separate sheets cere as patents, subscriptions, books, etc. This will greatly facilitate asserting your questions of the patents of the patents

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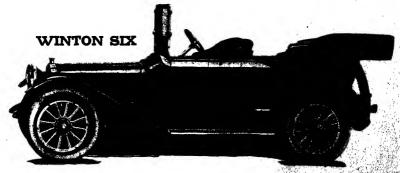
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Founded 1845

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The purpose of this journal is to second accurately, simply and interestingly the world a progress in scientific knowledge and industrial schicement.

#### The Speed Factor in Collision

OW many of the millions of people who sit at the sterring wheel of their automobile real ize how greatly the smashing effects of a cullision are increased by an increase of the speed? Those who have been through a smash- and survived—have n more or less intelligent appreciation of this relation It would be interesting to learn how many out ×hip of every one hundred drivers of automobiles are usua et that the destructive effects of an overture or a callision are increased not in proportion to the but to the square of the speed A driver who his touched the curb or side wiped a funce at ten miles an hour and escaped with unexpectedly small injury is surprised at the damage which ensues in case of a collision at 20 miles an hour and perfectly dumb founded-should be survive the disaster -at the huse wrought when the speed is thirty or forty miles an hour If he were conscious of the fact that the smash lng energy embodied in his machine was four times as twenty miles an hour as at ten time thu great at thirty miles an hour and sixteen times as great at forty he might still contemplate the weekage with dismus but not with astonishment. The moral of this applied to the automobilist is that an increase in his speed is a most imperative call upon him for an increase of vigilance and caution for a nicer judgment of speed and distance and for the possession of a steady nerve and onick wit-and wee betide him in an emergency if he buye not the last mamed

So also in the larger field of ratiroading the same have exact their heavy toll with the same remorseless precision. Broadly speaking we might say that not nicue in the destructive effects of collision-should it -but with regard to every element and human that enters into the question of safe rail reading the risk and damage increase as the of the velocity. Plans if we raise the speed of an exphess brain from sixty to eighty niles an hour the momentum of the traft will be nearly doubled and practically doubled also will be the amount of crush log and rending which will take place let us say in the forward part of the train liself or in the after part to the case of a real collision of the train into which It thus before the energy of the moving train has been expended and it comes to a state of rest. Furthermore the higher speed imposes a much higher stress both upon the trilin liself and upon the track and track structures over which it rups. The distances between signals must be greatly increased stace with brukes of the same officiency it would take a much longer time sicw d wn the faster trab

Will Westinghouse spaking upon this subject has recently stated that when emergency basks are set on a train which is toming at it into 6.9 miles an hour the train will be still mining at 10 miles an hour the train will be still mining at 10 miles an hour when II has advanced 1 100 feet from the point of application of the bracks whereas a train would be stopped altogether to 4.100 feet if its speed were culy 60 miles any hour

#### Bigger Lifeboats for Ocean Liners

This loss of the Titunic led to the formation of several important committees which we sin structed to havestigate the disaster and make suggestions designed to promote the castinction or safer whips better methods of Bit bout countra thou and spwage, and a general all around improvement in the conditions aftering safer, as see [or these committees one of the most september was that appointed in terral little and the property of the property

made public, is a most valuable sudiction to the Miles. ture on the subject, abounding as it does as suppostions which are at once conservative and prestical.

ture on the subject, accounting as 1 speed as suggestion.

B) for the most solvable suggestion—one that is no ensemble, we had almost said obviens, that the weights is that it was not made long ago—is that the size of infeboats shall be very greatly increased. The committee proposes a type that shall be of neswerthy size, so the size of the committee proposes a type that shall be of neswerthy size, and shall provide accommodation for no less than 250 passengers. They will be decked over throughout the greater part of that length and they will be driven by gasoline engines of sufficient power to give them a fair speed

The question insturally arises as to how boats weight in pointy 30 tions appear are to be launched and the committee suggests two alternative methods. They be live that daylts can be designed capable of being worked either by hand or by power which would easily made to the second of the size but they consider that in some cases a botter plan would be to permit the life boat to find off or the ship new down of the two methods we think that this is in question that the fourier is preferable. It should not be a difficult matter to design davits and gear compact and equally controlled which would how the a difficult matter to design davits and gear compact and equally controlled which would howe a 28-ton beat too the water with the same dispatch and certainty with which the present-5-ton boats are almanched. On the other hand there would be many risks insequantly from the halp as side foundered. Should the vessel go down on a fairly believe to the side of the control of the shap as side foundered. Should the vessel go down on a fairly eneme to damage but in the even of a ship soing down in the head at such a tyrene angles as were assumed to the control illustration of the side of the side of the two the head at such a tyrene angles as were assumed to the treatment of damage but in the even of a ship acting down in the head at such a tyrene angles as were assumed by the Tital illebusts as heavy as those suggested might break away from their cradies and be stove in hefore they reached ith water.

before they recched the wates. It is easy to be wise after the event and now that this committee has made this sensible suggestion to increase the size of lifebours it seems old that it should never have occurred to our must acciditate to increase the size of the libebout in some proportion to the avel increasing size of the ships that carried thus The fact that the life boost of toda is pastile ally of the same type as that in use fifty years ago shows how that false sense of security which led to lik lows of the Titank has caused the naval article tech and the shipowars to pas seem talention to the lift boat it itself. Become increasing, its size and betteing its construction little has been done toward its happroximat—it remains to day the same clumwing propelled craft that has littered the upper decise.

of our passenger ships from time immu morial.

The best lifebont is the ship itself, and it is encouruging to note that this is the conviction which seems to prevnil in all the technical discussion which followed the disaster of last vent 1 safe ship needs no life boat and the long line of these craft lining for hun dreds of fest the upper deck of our great passenger steamers is in itself a confession of failure a tacit admission 14 the shipowner and by the Govern that makes the laws regulating shipping matters that although we have succeeded in making our ships large and fast and comfortable we have not succeeded in unking them absolutely sufe. The very latest and making them insountely some The velv late bargest transatlantic liners such as the Maun-the Imperator and the remodeled Olympic been built with a special view to security Maurotante have foundaring Theoretically thoroughly subdivided and navigated ships need no multiplicity of life hoats if they are to be carried it is obvious that the 28-ton boat us proposed by the Boats and Pavits (om mittee represents the proper type. The largest of the ocean liners carries over sighty books of the prescut type collapsible and otherwise. They are an abominable nuisance to everyone concerned and take up much room that could be used to great advantage for the benefit of the passengers. By adopting the 250-passenger capacity beat suggested, eighteen to twenty lifeboats fifty feet in length would take the place of the eighty or more in a ship of the inrgest size The gain in safety and comfort by the use of such large boats would be immense They uld be thoroughly senworthy, and being power-pro pelled they would be able to make port, or at least steer for the location of the nearest ship as indicated by Bircless telegraphy

The recommendation of the committee that if smaller beats of the size now in use are placed on beard the should be used in parallel tiers with provision for launching on either side of the vessel is particularly interesting to the Schpthyle America, since this was the plan which we suggested and fillustrated at the time of the loss of the Triani.

Ancient and Modern Research on the Blood

The intimate connection of the blood with life
the notice of man From the very first he was

I to associate the crimson winn with bettle

and fleath, but the feus standards with processes has become latery to a large event of the control of the cont

But the circulation of the blood is after all a men mechanical phenomenon comparatively obvious in charso much so in fact that we are somewhat supprised that it should have so long escaped notice Much less obvious though of the highest importance, are the less obvious though or the interest importance, are severe-chemical processes in which the blood is involved and vet the understanding of these began at a time when the science of chemistry itself was still rather radimentary. Thus for instance it was pointed out as early as 1669 by Richard Loyer, that arterial blood owes its rich red color to the action of the air or as we owes its rich red color to the action of the air et as we mow should are to existent as the same year John Mayow showed experimentally that in respiration just as in combustion a constituent of the air is absorbed. That the heat of the body in due to this process was rightly discerned in 1871 by Thomas Willia, Similar observations were made in 1860 by Robert Boyle while the discovery that respiration produces carbon dioxide as a waste product, is due to Joseph Black (1757) With the field thus prepared for him Lavaisier had no difficults in fully appreciating the significance of then newly discovered oxygen for respiration and in 1777 he pointed out that oxygen is the only constitu out of the air which plays a direct tole in tespiration The investigali m of the chemical nature of the blood itself was necessarily reserved for a somewhat date involving as it does organic chemistry. In it cannot be said that all questions relating to the chemistry of the blood are at the present day complete-Much work of the biginest field has been done in our own country by Prof E T Reichert who has hild down in a memoir published by the Carnegle Institution the results of his researches on the crystallography of hemoglobins. The differentia has received considerable attention on account of the legal importance attached to such tests in the prosecution of criminal cases but the methods of examination ed by 1 rof Relebert for exceed in their billies such comparatively crude methods of different thation for by their means it is possible to establish the relationships of different species of animals. An article to this week's SUPLEMENT gives a detailed Him-

strike in this week's CIPLEMENT gives a detailed limitated account of this development.
While the blood has a definite and important familion to fulfill in health this does not exhaust the pregramme of its vital activities For it is inrucly owing - Initiated in the blood that we use special proce able to waid off or overcome attacks of various dis-eases. This is actileved partly through the formation of so called anti hodies in the blood and partly through a literal devouring of the disease germs by the amor bold white corpuscles of the blood. I nfortunately the victory does not always lie with the defending forces of the body and the so called blood parasites represent I nfortunately the a formidable army of enemies, among whom some of at deadly are the germ of the sleeping sickness and that of malarial fever both introduced into the body by the bite of insects Much work has been done in recent venrs and be it gratefully acknowledge ul work in the study and subjugation of these invisible form

A review of recent progress in this field by H G Plimmer will appear in next weeks issue of the Scientific American Supplement

Fewerful Rediscatation at Panama,—The Navy will shortly begin to construct a large naval radio attains the control of the cont

disc soutstess.

The property of the property a be built inexpensively and used to go

to Place of Perged.—According to a superior institute the American Institute that is now possible to produce cast copper direction conductivity that is mechanically only the conductivity of the conductivity Alight, adirected conductivity that is mechanically this common confidence of copper casting are due to a common common confidence of copper casting gases, and confidence on the common confidence of copper, and confidence passes, but no affinity for copper, the common common

ithing Mines by Wireless.—An Italian engineer, in reported to have devised a method thing sub-marine mines at a distance of several to the continuous of the continuous and the continuous and the continuous at the continuous and the continuou means of wireless impulses. According to the Major Ferrie, head of the Eiffel Tower Wire-Type Station, was present at an experiment Ultivi succeeded in exploding mines at a dissistant of the state of this kind has been made the lightest much serious experimental work, we confess the state of the state rable skepticism as to the results obtained.

to desirable rules steppicism as to the results obtained. The work of the statistics.—In the year 1000 select finding and executy-seven establishments were designated in the Utilited States in the manufacture of pages: from wood pulp. These gave employment to pages: from wood pulp. These gave employment to the distribution of \$1.473 persons and pull \$80,314,643 in all the value added by manufacture \$1.850,442,344, and the value added by manufacture \$1.850,2314,633. The growth of the Industry has been statementally the toperage in the decaded 1909 to 1909 \$1.950. Shenomenal, the increase in the decade 1899 to 1909 in the value of product being \$114,330,802 or 110.2

Carrying 3,127,000,000 Passengers a Year.—The Board of Trade statistics show that during the year 1912 the trolley lines of Great Britain carried over three billion passengers. Figures such as this give an impressive some of the magnitude of modern railway facilities, and the statistics are the more remarkable racentuses, and the statistics are the more remarkance when we remember that this traffic was carried on 2,842 miles of track and in less than 13,000 cars. Significant, also, is the fact that whereas in 1900 there were 37,000 horses employed in hauling street cars, in 1912 there were only 1,500.

The Opening of Another Tunnel Beneath the East River.—The Public Service Commission has approved saver.—The runnie service commission has approved an agreement with the Interborough Rapid Transit Company for the reconstruction and temporary operation of what is known as the Steinway Tunnel, which crosses beneath the East River from 42nd Street, Manhattan, to Long Island City. Built several years ago, at a cost of \$10,000,000, the owners agreed to have the tunnel transferred to the city of New York for \$3,000,000 in consideration of its lease from the city for operation in connection with the rest of the new subsystem. The tunnel is to be extended in Manha to Times Square and on the Long Island side to the Questishoro Bridge Plaza,

The firms because and on the long island side to be Queenshoro Bridge Plane.

A little-long Bridge-Robult in Tweive Days.—Gome feats of extraordinacity rapid construction have been performed, at times, in the history of American nall-reading; but we do not know of anything to surpass the feat achieved jointly by the Pennsylvania and Lehigh Vallay radiesuals in the rebuilding of over a raile of twa-track radirous bridge surves Newark Bay, which was intractly the night of June 16th. The bridge, food feat length of June 16th. The Labelth Vallay bridge, foods—sawting from the west and of the bridge, and the Spannylvanian pancy working from the opposite and. The first was yet in propess when the reconstruction and decided upon and the plane and ready. Orders were given for frauetoise. Jule drivers, faltered meeting and the consumption of the plane and ready. Orders were given to the construction and decided upon and the plane and ready. Orders were given to the construction and consumption spans, two longs, it to administration, the company through properties of the plane and trackly confirmed the plane and trackly. Orders were also constructed to the plane and trackly confirmed to the plane and the plane and trackly confirmed to the plane and the plane and the confirmed to the plane and the plane and trackly confirmed to the plane and the plane

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The Coal Beaucrose of the World use the subject of a 1,900-page monograph in source of publication by the executive committee of the Twelfth International Congress of Geology, under the editership of Mosses, Wm. McInness and D. B. Dewling. An atlas of about 70 conceed maps, 14200 inches in else, will accompany the work, and about 120 maps will be southered through the test volume. This publication will represent the results of the most through investigation ever made of the distribution of any mineral coropi iron, which was the subject of an investigation carried out under similar auspices there years ago. piece three years ago.

American School of Archeology in Chin American Subsel of Archeology in China.—A committee has been apoptized by the Council of the Archeological Institute of America to investigate and report on the plan of establishing an American school of archeology in China; its objects being: (1) To prosecute archeological research in castern Asia; (2) to afford opportunity and facilities for investigation in Asiatic archeology; and (3) to preserve objects of archeological and cultural interest in museums in the ountries to which they pertain, in co-operation with activing organizations for a kindered purpose, such as the China Monuments Society, organized by Mr. Frederick McCormick in 1908 at Paking.

The Beforeign Telegosper.—In the Scientific America

Protential McCorminic in 1908 at Paking.
The Reflection Telescopes—In the Scientific American of July 12th, 1913, there was published an article on the reflecting telescope, by Edward A. Path, director of the Smith Observatory at Beleit, Wis. Such a large of the Smith Observatory at Beleit, Wis. Such a large mumber of longuities have been received, both by Mr. Path and ourselves, asking for further information regarding this type of telescapes, that we desire to call attention to Nos. 1818 to 1917, insientive, of the Scientific Austrace, Strummanner in which was much labeled. attention to Nos. 1818 to 1917, insiderive, of the Science Trife Aussican Supressions, in which was published a series of six articles by G. W. Ritesbay on "The Modern Reflocting Telescope and the Making and Testing of Optical Mirrors." These articles treat the subject in detail and give much valuable information. Blood and the Conservation of Basegy.—While the study of the blood is sensestisfly a matter of biological

interest, it is a somewhat remarkable fact that it also furnished the due to Julius Robert Mayer for his discovery of that fundamental law of physics, the law of conservation of energy. Mayer observed, while traveling as a ship's surgeon in the tropies, that the venous blood of his patients (in the days when blood-letting plood of the patients (in the case when noted-acting was still in general vogue) was very appreciably brighter in color than in ordinary practice in the temperate zones. From this he rightly concluded that there was a definite relation between the chemical action going on in the blood and the amount of work or heat fur-nished by the body, and thus following up his argument point by point, he was finally led to the co that the total amount of energy of a given system is constant, that energy can neither be created nor destroy-ed, but only converted from one form into another.

od, but only converted from one form into another.

A Usique Climatic Observatory is maintained at Davas, Switzerland, by Dr. C. Dorro, who has recently published the results of the first three years' work at this institution. Dorno's observatory is remarkable for the fast that it is securing records of many important but labberto neglected factors in climate; it contexts, for example, is a striking manner with the conventional methodologies station maintained by the Davos Kurversin. Special attention is devoted to the measurement of radiation, insteading separate records of the thermal, laminars, phetographic and photo-electric intensity of direct radiation from the eur; also the combined radiation from the eur; also the combined, and the like. Already some interesting discoveries have been made as to the composition of the famous places sumshine, and its fluctuations with hour and sasson; facts that have important therapeutic againstances. The name, and its nucerisatons with nour and season; inside that have important therapeutic applications. The meet intense ultra-violet radiation eccurs in summer, and this, it is suggested, explains why the invalids at Davos suffer with "gladet-burn" at that season. A sin-Davos suffer with "glader-burn" at that season. A single summer day may give as most better-richt resistion as a whole sensith is wrinter. On the other hand, the theorem's resistance of strong-pheric electricity are also underded on its acquestions of strong-pheric electricity are also underded on its acquestions with multifactors methods developed making during the past decade. Beamslorf electronsiers are used as accuse conditators registration, in its remarkable engineering sed methods the institution, may be said to be a generation in advance of the engineer method engineering accuracions of the world—in which respect is may be alseed with the observatory of the Etros, in Spain, a, action of which was published in the Equation Assessment of October 10th, 1910.

Language in a Channel of the Channel as Dunne has solved the problem of resulting and has produced a machine that the besteered. He predicts that event-she type of accordance will be used. This is a chaped like a letter V and has no tak-

states type of acroplane will be used. The models is shaped like a letter V and has no tab.

Legacia the Legacia Company. -In the measure report of the campany which constructs the factorial report of the campany of the campany which constructs the campany of the cam practically half of the working capital. Inasmuch as large sums have been received from the German government for experimental purposes, and also consider-ing the fact that the price of the vessels has been doubled during the past two years, having mereased from \$125,one to \$250,000, this loss seems excessive. This can be accounted for, however, by the high cost of experi-ment and on account of the fact that no absolute standard model has been adhered to, although all the Zeppolius have been outwardly similar in appearance,

A New Height Record.—The breaking of world's records in almost any sport has become so common that it often fails to attract the deserved amount of attention. The latest height record for an aeroplane, for this reason, has gone almost unheralded, and few besides those actually interested in flying realize or appreciate the accomplishment of Harry G. Hawker, who, on June 10th at Brooklands, set a new British statude record for pilot and passenger by rising 13.400 feet, a distance equal to more than two and a half miles. He used an 80 horse-power Sopwith tractor biplane fitted with balanced ailerons. On the same day he also broke the British record for an altitude flight by rising with two passengers to a height of 10,800 feet.

Piest Air Collision Case Settled. After a litigation of bearly three years the action between M Thomas and Capt. Dickson, as a result of a collision between their acroplanes while flying at the Milau meet in 1910, has at last been settled. It was recently decided that has at last been settled. It was recently deeded that Dickson was responsible for the accident, and he accordingly directed to pay \$1,000 damages to Thomas and \$2,000 to the manufacturers of the Automette acroplane which Thomas was flying at the time of the accident, heades being ordered to pay four fifths of the cost of the suit. In the original bill of complaint Thomas had asked for \$16,000 damages, while Dickson had put in a counter claim for \$20,000 for injuries and for the destruction of his Farman aeroplane

The New French Military Aero Stations. first of the military acroplane stations built with the funds raised by national subscription in France has just been completed at Everenx, and it contains a model hangar with annexes such as repair shop and the like, also a telephone post. This statum is the first one of fitty-litree aeropiane statums which are to be completed by next October, and in three months it is stated that there will not be a single point in the triangle extending from Paris to the frontier where an aviator will be more than 25 miles from a well-organized landing station. Besides this. the principal acrial routes between the large cities, such as Paris to Marselles and to the Channel, will have similar posts placed along them at short

Wreck of the Schütte-Lanz Dirigible.-The stren and lifting power of balloons is seldom realized by the reading public until an air craft suddenly demonstrates its possibilities by cutting up capers without the guiding the possibilities by criting up capaca within a single hand of a pilot. This was forcefully brought out on the recent (also its last) flight of the German dirighle "Schütte-Lanz I," which sailed from Königsberg on July 13th for Berlin, but was compelled to alight at Schneidermühl to replenish its supply of hydrogen. The ship was moored to an anchor sunk six feet in tho ground and as an additional presention a force of 300 men from the neighboring garrison were ordered to be ready to hold the balloon down in case of a storin During a high wind one of the cars, a motor and several instruments were damaged. While repairs were in instruments were damaged. Within repairs were in progress a violent gust struck the vessel, raising the stern about 100 feet in the air. The soldiers were so completely taken by surprise that all but two released their hold on the ropes. One of these fell from a height of 30 feet and was badly mured, while the other clung to the vessel until it had risen to nearly 1,000 feet when he also released his hold, and dashing earthward, was immediately killed. The ship hovered over the town for nearly an hour and then gradually descended. Driven along by the wind close to the ground it bowled over atong by the wind close to the ground it to owner ever trees and telegraph poles in pussing. A large body of peasants endeavored to arrest its flight by tying its cables to fir trees. The straining of the large bag, however, soon tore the trees up by their roots. When a sufficient quantity of the gas had escaped the ship collapsed in a forest with its framework broken and

A Curious French Gidding Bost  $O^N$  the Schre at Triel, France, a curious looking  $O_{\rm craft}$  is attracting much attention. It is a water glider propelled by means of an aeroplane motor and screw propeller, but resembles in no small de-

gree a seew or raft. This new "fiyer," as it is termed by its designers, is owned by M Paul Tissandier, and was built for him by Courte de Lambert.

The glider is really a kind of hydroplane, for il consists of five light floats or steps. to which the deck is attached, the total length of the craft being 7 meters, or nearly 23 feet. It is equipped with a 160 horse-nower Gnome engine, and is credited with a speed of 85 kilometers (nearly of with a speed of so knowleters (heart) 53 miles) per honr. When skimming along the surface of the water at this speed, the floats are almost entirely out of the water, and if wings were attached at the sides the craft could be converted luto a hydro-neropiane

gilding hoats and similar machines date province none and aminer machines date back nearly twenty-four years. In 1893 to a Tissandter glider with the propeller under water, and a speed of 28 kills per hour was obtained. Several different motors were tried by Tissandler and it was with his Buchet engine attached to a dirigible balloon that M. Santos-Dumont made his first memorable trip around the

#### Shifting Gears by Electricity

WiTH the successful employment of electricity both for lighting the modern automobile and for starting its motor as well, an additional step toward the evolution of the hoped for "push-but-tou-operated" car has been made. And now the gear shifting problem, too, has been successfully solved with the aid of electricity

Nearly a year ago the first electrical device designed to permit quick altera-tion of gear ratios by the mere depres-sion of a button made its appearance in Detroit, Mich., but it never proved a com-mercial success. Recently, however, a second device of the kind was placed on market, and so successful h en that already it has been adopted as

standard equipment by several prominent automobile manufacturers, thus making plain that it is a device that must be reckoned with. Like its predecessor, its vital principle is magnetism. It operates in conjunc tion with a combined electric lighting and engine starting system.

Despite the complication that generally attaches to tilings electrical, the mechanism is extremely sim in its essential elements; the whole of it is contain mely simple within the gear case, and it is therefore fully protected from accidental damage and from dust and dirt. In fact, it is more mechanical than electrical. Instead of

being alternately connected with a slid ing hand lever working in the ordinary li-gate quadrant, each of the gear shifting arms has its own powerful solenoid which is operated from the batters that server to operate the engine starter. The am of carrent drawn is small - about 15 am peres-and us the contact is only momen tury the effect on the battery is negligible, particularly in view of the fact that the initery is constantly charged. The pull of the solenoids has been calculated as about 150 bounds, which is several times ordinarily obtainable with the usual hand lever, consequently genrs are quick ly and eastly shifted

The control of the apparatus is vested in a row of six small buttons arranged as shown by the accompanying illustration, on one of the supporting arms of the steering wheel. it will be noticed that the genr shifting lever is absent, the rematiding lever being the emergency brake control. The control buttons are arranged tike the luttons of an inter-communicating telephone system; which is to say, that when one is depressed it stays down that when one is depressed it stays down null another is depressed, when the first automatically springs up. This is to pre-vent the possibility of two gears being en-gaged at the same time, though even if this were possible the pull of opposite aboutly would esselv in an another in the pull of solenoids would result in no movement.

All of these six buttons, merated from 1 to 4, for All of these six buttons, numerated from 1 to 4, ror the four forward speed, "N" for neutral and "R" for reverse, are connected in multiple with a master con-tact operated by the clutch pedal; hence, say of them can be left depressed indefinitely without causing a



The deck of the glider is built over five wide floats



New Lambert-Tissandier "Fiver" uses a Gnome engine and air propeller.

drain on the battery, for no current will flow until the

then immediately the clutch pedal is depressed to the limit of its travel, which would be necessary in any case to engage the gear by hand; first speed is obtained automatically without further attention from the driver. In other words, depression of the control but-

matter with is closed by the depression of the clutch pedal. Thus, the clutch can be disengaged without the necessity for changing gears, three inches of clutch pedal movement being provided before the master con-In operation, the button marked 1 is depressed and

the other half, wh

gear ratios is ext on of any oth utral button) gear to be shifted int vided to permit any of to be released when the inal stand-still.

#### How Fish are Ad of Wat

CERTAIN fish living of have the swimming b more or less by a cartilage ing, and as M. Otto Thile curious to note that fish we the sea bottom have no

The covering may be only pa the carp, ranging up to a cous-ing as is found in the Cobi ch lives almost entirely bi mud. tween the structure of the swin der to full of air it tends to le r organs. In the 4 udot of the Kameroon region, the ins but little air, so that the scarcely any strengthening to be here. An extreme case is found a much filled out with air it is pred a shield in front, preventing it fre ing on the heart and esophagus. . Were it not so, the bladder would blad blood circulation and respiration. The the filling out of this organ. In some cases the bindder has a fine clastic ture membrane surrounded by a stoner, on thus resembling a rubber tire.
While river bottom fish have an or

swimming bladder, in sea bottom fish it awimming blauder, in seas cotton and disappears altogether in most cases. Size nature of the bottom may account for this difference. The air bladder of a fish entering and leaving soft mud has time to itself to the different pressures. In the case of the Pices, living in sea bot-

tom to a hard and compact sand, the fish makes a great effort to penetrate into the sand, and when it comes out suddenly its highly-compressed bladder would expand so much that it would be in danger of bursting. Hence, in this case the bladder disappears, owing to adaptation to surroundings.

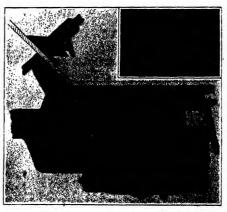
#### Caste in the Social Insect

THE study of social insects such as the termite has niways is no of interest, especially regarding the division of such insects into castes, each caste showing

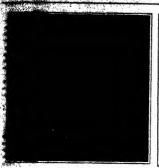
a difference in appearance. The white ants have several castes such as soldiers, workers and reproducers or sexuated in-sects. Owing to their defensive rôle, the soldiers are wingless, but have very strong mandibles, while the works with building the ant-hill and bringing in food, have a characteristic form; like soldiers, they do not reproduce. On the contrary, those of the caste known as re-On the producers have their organs well devel-oped, and their only office appears to be that of reproducing the species.

Prof. Bugnion, a Paris scientist, is oc-cupied with the problem of ascertaining when these different forms of the ant be-gin to appear. Hitherto it was thought that after hatching, all the small ants had that arter datening, hi the small arts and the same shape, and later us became sol-diers, workers or reproducers, this being accounted for by differences in feeding or the presence of parasites in the body. author however shows that on leaving the egg the insect has its characters well marked so that the casts can be seen. For instance, in the Estermes Isonatria the soldiers have a frontal horn which is tacking in the others, and this horn is observed even in newly-hatched specimens. In other species the mandibles can be dis-tinguished even at this saviy stage, and in several the division the cases, 'the there of sexes, before the birth of the larve.

THE PROPERTY OF THE PROPERTY O



Press a button and shift your gears.



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### Teaching from the Child's Point of View

A New Science Created by Prof. Ernst Meumann

By Dr. P. R. Radosavljevich, New York University



Apparatus for measuring blood pressure

ns of education underlie all vital prob-You will find it in the fact revolution in the history of thought was out reason that we call our science of educa "Todagogy;" for to the Greek paidagogos was a the method of bringing the undeveloped mind to the mind of a child this luftuen shield to be attained. In a broader sense, educa-discipled every influence that a mentally strong time exert on another person. That includes medication. But in a narrower sense, educaschool education

hool education begins and ends with the alt; for the adult teacher works backward on a imposes sis own ideas upon the school child. For that rebush this ectence of podagogy in this twentieth century has developed no further than physics or natronomy had developed in the time of Galileo, and that, despite has averaged in the time of Galileo, and that, despute the fact that pedagogy is two thousand years old. What a peradox it is that scientists opend years of the control of same plants, but have as yet lavished no attention, scientifically speaking, on their own children and pupils.

Perents devote more time to the cultivation of gardens to embroidery than to the education of their off-Even governments have as yet done pracnothing in endeavoring to ascertain scien what are the conditions that are most favorable to the child's physical, mental and moral develop-ment, as compared with what governments have done in the development of agriculture along scien-

Aftar centuries of waiting, we at last find a begin-ing made to establish a new science of experimental bedagagy, a science which instead of following the aid a priori methods, accepts the surer method of exentation and acquires more accurate and positive knowledge about pupils—a knowledge both qualitative and quantitative, by means of which we can free oursaid quantitative, by means of water we can ree our-selves from the tyranny of traditions as to what constitutes an average school child. When that science is developed we shall be etter able to understand what basis there is for the pedagogical belief that schools must be respectors of Individuality.

The new science of experimental pedagogy suches all its problems from the standpoint of the sool child. As might be supposed the new movement originated in Germany, the land of pedagogy. And the man who has made it possible, the man who gave the first impetus to the movement, is Prof. Ernst Meumann, now in Hamburg.

Meumann the Creator of a New Science.

Experiment is the guiding idea of Meumann in treating educational problems. His pedagogical laboratories is erg, Münster, Halle and Leipzig became the conclum senctorum of all his numerous pupils who would know the aducational truth and understand the workings of the child's golnd and the workings of the child's mind and the scientific character of pedagogical prob-lems. But our chief obligation to him comes from his numerous experimental probangetics writings. His "Lockures for the Introduction to Experimental Peda-sogs" (in 2 wals, indicate a vigorous properties of the kind as per in print. From the locking of the kind as per in print.

Pedagogy in this alleged twentieth century is bout in the same condition as was astronomy in the time of Galileo. A science is needed to deterr individual differences among children. When that science is developed we shall be able to classify, science is developed we shall be able to cussing, grade and promote pupils scientifically, and not divide them according to ages or slees or school marks as so note foolishly do. Some day we will have a real science of experimental pedagogy. A heriunius has been made by Prof Brust Was This article, written by one who has st him, sets forth in a simple way the basic principles of that science. Some day when the new pedagogy will have assumed the importance and dignity of total name assumed the importance and alputly of botony or ohemistry so well find in overy large community a clinic where parents and teachers may receive advice on school matters, a bureau which well not as a consulting empineer in educa-Honel affairs -- Porrow

what extent the method of experimentation has equipped educators with knowledge as to the facts of school children's development and reaction under in-

an does not agree with James, Minsterberg and other well-known psychologists who claim that education has gained little from experimental psychological investigation; he holds that it has gained very much and pleads that pedagogical experimentation is slowly emerging as a field quite distinct from purely perimental psychology because its problems are more implex and are made with practical ends in view Experimental pedagogy does not try always to reduce all problems to their most elemental form; it is more synthetic, while experimental psychology is more syntacte, while experimental psychology is more analytic. And then the teacher's aim is not the ac-quirement of psychology as a critical doctrine, but as an experimental study of his own school questions. Experimental pedagogy deals, therefore, mainly with the school children, including young women and you men. Meumann aims (1) to show that experiment en and young pedagogy enables the individual teacher to be at all ite clear in his own mind as to the justification of his pedagogical measures, and (2) to impress upon the teachers the necessity of seeking to answer upon the teachers the necessity of seeking to answer all pedagogical questions from the pupil's standpoint in order to rid themselves of the conception current in older pedagogy that the child is merely an adult on a small scale.

Statistics vs. a Knowledge of the Child Mind. Although Messmann admits that pedagogical theory has been the chosen Seld of amateurs and of self-edu-cated persons, he fully recognises the folly of those

modern experimentalists who pile up statistical masses of apparent facts without, as a preliminary, striving to get a thorough-going analysis, I e., without a full and clear conception of the psychological units in-volved. We have to keep in mind that a statistical conclusion is not a psychological interpretation, and that a psychological possibility does not mean necessarlly a pedagogical necessity.

ann shows that in educational theory as well as in educational practice new fields and standpoints have been acquired or at least confirmed scientifically which previously had only a remote connection with school education or none at all. Educational legislapedagogical therapeutics or orthogene must be based on science, i. e., on general scientific truths, not on educational idiosyncrasies and personal partiality. First of all we must see the truth, i. e., we must know exactly what pupils are, what their development is, and for what they are fitted.

What is Intelligence?
Take for example the problem of intelligence. the differences between the bright and dull pupils in kind or in degree? What is really intelligence? Is it inherited or acquired, or both? Can we distinguish general intelligence (innate, unspecialized mental efficiency) from acquired knowledge, interests, dexterities, and from specific endowment, aptitude or talent? Some believe that the child is bud by nature talent? Some believe that the child is bad by nature (Francke, Palmer, Graser); others claim that the child is good by nature, but it is spolled by its environment (Rousseau, Pestaloggi, Froebel), still others claim that a child is neither good nor bad, it has only general unspecialized dispositions which may be deveigeneral unspecialized inspositions which may be devel-oped in either direction (Wundt, Judd). Or, in regard to the pure intellect some believe that the child's in-tuiligence is inherited (so-called notivistic theory of Galton, Pearson, De Candolle); others claim it is acquired (Stills's empiricism); and those who share the theory of genetism (G. Stanley Hall, Dean Balliet, Horne) say that the child's intelligence is both inherited and acquired.

Meumann thinks that all these more or less different theories may be good for their own purpose, and a teacher who is dealing with a normal school child must judge a pupil's intelligence not only by its ac judge a popil's intelligence not only by its accom-plishment of school tasks, but also by the energy (effort and time) expended in reaching this goal. Thus, three pupils may have the highest mark (A) in solving an arithmetical problem, but one did it in 3 minutes, anarithmetical problems, out one did u in is minutes, an-other in 80 minutes, and the third in 80 minutes All three had the same, highest mark. Which is the bright-est? Or in memorizing a poem all three receive mark A, but one needs 3 repetitions, another 30 and another 60 repetitions. Who is the brightest? Meumann gives

therefore, the following formula to de termine a child's school intelligence

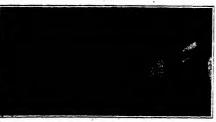
School Intelligence ==

Energy Expended Estimating Intelligence.

He mapped out a plan of studying gen eral intelligence of normal pupils, dealests material which involves the ability

ing with it not as a whole, but only with some of its higher capacities. For these higher functions of intelligence he sugto work with abstract material in a purposive way, seeing new relations and breaking up old combinations. He disagrees, therefore, with those (e. g. Eb tus) who claim that intelligence is the capacity to form new and original combinations, because a witty man does

(Concluded on page 152)



The orgagraph is an apparates used to study fatigue.

### The Vast Ore Deposits of Cuba

By Heary Hale us see pages 146 and 147 )

The discovery that Eastern Cuba is over-laid with a deposit of Iron, accessible for mining without tunnelling or shafting, which aggregates fully 500,000,000 tons or more, means that a new source of supply is available for the American iron and steel industry that is of the greatest importance. Less than ten years ago was this deposit investigated. In 1904 samples of ore were taken from a small area that were found to con-tain over 50 per cent of iron. This was followed by 8 more exhaustive study of what is known as the Mayari district, by pits 300 feet apart, with borings made with a 2-luch carpenter's anger in the bottom of each pit. At first, each foot of pit the borings were analyzed separately; but the ore proved of such uniform quality that samples were then taken of each 6 feet, by borings only, and the distance between these was increased

lings only, and the displace between lines was increased to 1,000,1,000, and 1,750 feet.

The only from ranges in this country that can be contrasted with the Culous deposits in extent are the Superior, which in their earlier bistory supplied 75 per coul of the ore consumed by American furnaces. James J. Hill was the ploneer in opening the Superior The large quantity excavated from the Menomince, Marquette, Mesabl and Gogebic—the largest ore beds—can be realized when it is shown by authoritalive records of production, that during twenty years mining has been conducted on such a large scale that

thilly 250,000,000 times have been taken out.

At the present time the annual output of ore is nearly 60,000,000 tons from the total ore mines of the country, of which Superior ore now represents about SOUND, ON tons of available ore of a quality for smell-ing, in contrast to the 75 per cent of the entire Ameri-can output in its earlier era of mining.

The ore in its natural state contains a very large per centage of water, which increases to some extent with the death below the surface. Near the surface it is red r, with somewhat granular structure. The color gradually changes with depth, finally reaching a bright The consistency also changes toward the bot tom to a ciay-like, sticky mass. The relative proportion of red and yellow ore is quite variable; in some places the yellow reaches close to the surface, while in others the red extends almost to the underlying ser-

In the Mayarl division of the Spanish-American Iron Company, the ore lies on an irregular platean, about 15 miles long and 5 miles wide at the widest point, entirely covered with pine trees and brush, which gre directly on the ore. The elevation at the northern extremity, which is approached by the railroad, is about 1,700 feet above see-level. At the southern end the general elevation is about 2,000 feet. Ore is removed by means of scraper-bucket excavators and steam-shovels, these muchines toading into special standardgage, side-dump steel cars of 100,000 pounds capacity.

The Spanish-American from Company is also operating hard-ore mines of the Daiquirl group, on the coast of Cubs, about difteen miles east of Santiago. coast of tuna, moon inteen miss east of Sautingo.
The main ore properly al Dalquiri, once considered as
three separate unlines, San Antonio, Lola, and Magdi-lenu, has now developed into a practically continuous
body of orc. The ore in the Lola mine can easily be body or ore. The ore in the Lois mine can easily be distinguished from the waste by its darker color. The waste-banks are on the right and the ore-lowering in-clines on the left. Both the ore and the over-burden moved from a series of benches. Fourteen steam shovels are employed for stripping, the largest of which is a 90-ton Marion carrying a 4-yard dipper All are served by iccomotives and trains of side-dump cars for removing the rock to waste-banks on the back side of

On account of the rock being mixed more or less with the ore, it is necessary to load all of the ore by hand iulo smali curs, which are run to lowering-inclines These inclines carry the ore in skip-cars to the main-line railroad, which runs from the foot of Lola hill to in Playa, the shipping-port at the coast, four miles from the mines

A hoisting-incline is provided for raising coal, ms ery, aml general supplies from the main-line railroad to any level of the mine. A modern nir-compres-sor plant is located along the rallroad near the San Antonio mine, and a pine-system is arranged to furnish compressed air for tunnel-exploration and for g crai service to any part of the mine—Steam-drills are used in the principal blasting-work—Ore is also brought from the Berraco and Signa groups of mines, located trum the betrace and signs groups of mines, occured to the east of Dalquirl, over a marrow-gage raifroad laining the standard-gage main-line about two miles je-low Dalquirl mines. All of the ore is crushed before shipment in a Gates crusher-plant to slow-suitable for use in the blast furnaces.

use in the hist trunces. The contour of the ground at the point where ex-cuvations were begun, in the Mayari district, though ampearing to be quite regular, is not ideas for steam-shove operation. The depth of ore is not uniform,

in many places the underlying rock projecting far up into the ore, even to the surface. The general slope of the ground, even in the most nearly level places, is quite irregular. Therefore, it is difficult to find many places where it is possible to operate a steam-shovel for an extended period in a cut of economical depth without including a considerable portion of the rock with the ore excavated. For this reason the acraperluicket excavators are more satisfactory as well as more economical for excavation, although their ospacity is considerably less than that of the large-size shovel used. Three of these excavators are now at work, together with one 90-ton Bucyrus steam-shovel. The vators operate 1.25-cubic yards Page buckets, ough a larger capacity of bucket is contemplated. The bucket swings through a radius of 80 feet, and without difficulty removes all the ore for a width of about 100 feet down to the rock bottom, the projecting rock and stumps being discarded. Each a crew consists of one operator, one fireman, and three pitmen. As the machine works up hill or down hill continually, and the track follows the same grade, cars can be dropped down by gravity to be loaded as needed, with a minimum amount of locomotive service.

The nodulizing plant, located on the east side of the The hodulizing plant, located on the sear side of the raw-ore yard, consists of twelve rotary kins, 10 feet in diameter, and 125 feet long, set at an inclination of % inch per foot, and 20 feet apart. The kins are of the type commonly used in the manufacture of cemest. The diameter, however, is unusually large in order to overcome trouble from "ringing-up" in the hot sone, which often causes serious delays in the operation of klins of smaller diameter. Each kiln is carried by two steel tires rigidly fastened to the shell. The cut-steel stee: tree rigidly materies to the shell close to the tree near the cold end is 132.78 inches in diameter, and 4 inches in pitch. Each klin is driven by a 35 horse-power variable-speed motor. A 7.5-ton over-head electric traveling-crane, carrying a man-troller with 3 cubic yards grab-bucket, is provided for removing the nodules from the trough of the nodulizing plant and loading them into 50-tou electric transfer-cars on the track passing alongside of the trough.

The construction at the water-front is somewhat unusual. Close to the front leg of the bridge, and parallel to the rount of the front reg of the brings, and paramet to its runway, is a treath extending over one side of a trough. A transfer-car brings the nodules from the nodulising-plant, and discharges from one side into this trough, in position to be readily loaded into the vessel, or to be moved back to storage under the main span of or to be moved back to storage under the main span of the bridge by the grab-buckets. The bottom of the trough is one foot above high life. Its outer wall is formed by planking spiked to a row of piles. All of this construction, being above the water-line, is not subject to damage by the teredo navalis. From the outside of the trough-wall the bottom drops off at an a 45 degrees to 28 feet deep at the fender-line, which is approximately under the hinge of the boom of the

vide a suitable harbor. A basin 1,500 feet long, 200 feet wide at each end, and 400 feet wide at the widest point, was dredged to a depth of 28 feet. The approach-chanwas dregged to a depth of 25 see. The approximation, etc. 2,500 feel boulg and 200 feet width, was dredged to the same depth. Felton, on Cagimaya Bay, a well-protected branch on the south side of Nipe Bay, close to its entrance, has proved a very safe and satisfactory

Each year more investigations are made of the de posits beyond the mines opened, and the results confirm the statement that this and the Mayari beds con-tain fully 500,000,000 tons with an extensive area still d. The tonnage available for steel making may be 600,000,000 or more, as only a half militon toms or more of ore are mined annually.

#### Treating Tuberculosis by Marine Micro-organisms

M UCH has been written of late on Dr. Friedmann's M tuberculosis cure by means of son turtle microbes. in a memoir submitted to the French Academy of Science, Dr. Raphael Dubois, professor at the University of Lyons, draws attention to his own experi ments on similar lines, begun as far back as in 18
Twelve guines-pigs inoculated with tuberculosis crobes, so as to become manifestly infected with the disease, were treated with a micrococous derived from a pearl-producing shell-fish of the Hyères seacoust, and with a single exception, were kept alive ton months afterward. The seeming curative effect of the effec-corcus was put down to its "calcifying" action as allows

conces was put down to its "cuttilizing success as a little foresistion of pental.

Now Dr. Dubols recently obtained from the recent department of the Toulon shughter-house some conscionations, as foresist special special cours concertions, as foresist special part of the conscionation of the observations of the conscionation of the conscionat in the image of two oxen seemingly in course or issuing, and in the liver of a tip, respectively. From the distinct current shells of these lesions he prepared estimate of several species of becterin, one of which, we had had been several species of becterin, one of which, we had had been several species of becterin, one of which, we had had been several species of the several species.

Pt at d in ele mitien. there is practi chills, the same as a

the healing effect which the sing exert on the tuberculous occurred with it.

#### Pludsting in the

By C. Dismille

EN the war of the future shall we approve against seroplane? It may be are difficulties. In the first phos. over modern fortifications and over the pled by a modern army is vast. Unless aeroplanes deliberately ferret each oth

aeropianes deliberately that they may be happen very naturally that they may be There is a psychological side to this is his novel "When the Sleeper Wakes" surmises the stress of a combat between a the air would prove too much for twenty-securage. It seems not quite within the twentieth century courage Bulgarian aeroplanes, scouting at Tchatalia, one mother—perhaps because there my versal of the psychology of braving an the ground. The ground is so remote rent plane; but a machine rushing th at express train speed is fearfully on the and has the potentiality of getting so u A man without skates on smooth ice, or with es on the top of a narrow steeple, is a sively inclined; the military aviator is in ne orable position. To exchange chance rifle sho distances is psychologically too indecisive. Or hand, if the opposing pilots approach each of closely, either may find himself rushing alor

situation as desperate for him as it is for his e Probably the first whole-hearted aerial strack ern warfare will be delivered from a very he safe dirigible, a craft that can at least boast o tical firing platform, notwithstanding the danger of a flagration. The fact that Zoppelins have been arm with machine guns shows whither the tende

#### The Current Supplement

I N this week's issue of our Supplements, W. J. Hum-phries contributes an interesting article in which he shows that the presence of volcanic dust in our atmo-sphere has probably played a most important part in determining the climate of our earth in past ages.— A general review is given of the modern status of eléctro-therapeutics.—Our readers are well acquainted with the intermite and its uses. A field in which it seems to promise particular usefulness is the repairing of dam-ages to sea going vessels. This application is described and illustrated in an article by L. E. Browns.—The lighting of the modern manufacturing plant is an issuportant problem, and not only from the point of view of humanity and sanitation, but also as a purely commercial consideration, in view of its direct influence upon manufacturing efficiency. "Making the Best Pos-sible Use of Daylight Hiumination" is the subject of an article dealing with this topic.—Prof. H. B. Dixon, working in conjunction with C. Campbell, reports on investigations regarding the effect of incombustible dusts on the explosion of mass.—Prof. P. Behrens writes on the Aesthetics of Industrial Buildings, that is to say, on beauty in technical structures, as determined by perfect adaptation to useful ends.—An article entitled "Our Life Blood" tells us many remarkable facts reparding a countrient of our body which is not only most important for life, but also full of inter-setting properties.—C. A. Battiscoule describes a very recogning scheme for exploiting the power of the tides.

—F. Campbell writes on Curiosities of Binocular

#### A Monument to Schlape

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aditions were must responsible for statements nos column. Anony nnot be considered, but the nam admits will be withhold when so desired.]

### is the Maximum Parcel Post Cylinder?

Sales Since of the Science Turves was Cymmunian Since of the Science Turves Turves (The State of the Science State of the Science State of the Science State of the Science State State of the Science State Since State State

#### a Automobile and the Locomotive

The Editor of the SCIENTIFIC AMBRICAN:
On page 14 of your issue of July 5th is a photograph
is 100-on locomotive being towed by a 2-ton automobile. Let me call your attention to a slight mistake

The car in question is a Studebaker (E-M-F) "30," which is of 30 horse-power and not 40, as your story states. And in addition, the car weighed less than 3,000 pounds without its load.

THE STUDEBAKER CORPORATION OF AMERICA,
W. S. PETTIT, Advertising Manager, Detroit, Mich.

#### Lightning Prints

To the Editor of the Scientific American: I observe with interest a quotation in the Literary Digest talest from your issue of June 28th in which Charles F. takes from your same of June 28th in which Chaptes F. Takesan holds shas "lightning prints" res esimply tensor of the branch-like source of the discharge. My own observations tested to verify his statement, for I have seen those imprints upon horses and cattle killed by lightning on the buffsloopmen prints of the West in places where the encarest tree was miles distant and in some instance the wave necessary or other obligate than stank where there were no trees or other objects than stosi within sight. I have seen a number of variations of than "prints," and in many cases the hair was burned in dis-tinct lines down the animal's four legs to the heofs.

#### An American Coffee Made of Figs and Prunes

To the Editor of the Screwtric American: Relative to your article regarding the Feigen-Kaffoo of Austria, there is made in America, at Ran Jose, commercially, an article out of fige and prunes which is so superior to coffee that if people did not use the real onfise for the narcottle effect, it would entirely supplant office. The Harver is delicious and rich, the color fine. coffee. The flavor is delicious and rich, the color fine, and moreover it is even improved by warming over. Less is required than of coffee. It is a real food and rich in phosphorus. Of course, the advertising feature prohibits the mention of its name, but I did not like to have Austria carry off any honore in this respect when we have something better at home. It is really too bad for the health of the antion that the concern which manufactures the product does not exploit it outsides of a small local territory.

O. F. G. Dav. Minnescolis, Minn. Minnes

#### The Automatic Railroad Stop

The Astrometric Matterest Stop

To the Editor of the Scrawtrro America:

I have read with much inserest your article in your
issue of July 19th, estitied "The Competition for the
New York, New Haven and Hardord Railroad Company's Automatic Stop." This article affords a very
good idea of the great assuant of interest which inventors
as well as the general public feel on the subject of automatic train source. Research conversees in the mitroad
world immertably emphasise the importance of the
subheat.

revise manuscury empasses tan importance of the subbot.

One general impression, however, though held very widely, is eromeous, and this your article tended to enhance rather than correct. It is true that most of the derives and place that the mindled have been impressible. Nevertheless, sayous who has made a capital study of the subject knews that a namber of devices already offer considerable promise and that it considerable made produced in the power held with the control of the control of the produced interest of the produced interest in Mr. Religion. Statement, the reasons that control of the c

in the New York subway and elsewhere. The second kind is of the electrical type with continuous contact, using electric current picked up from a third rail. Of this type you mentioned two systems in the article re-

The third kind is also of the electrical type, but oper-aise by "wireless" or induced current. Probably the best example is that known as the Detroit automatic train control, a description of which is printed in the July issue of the Signal Engineer. It is to be noted that this device conforms to the primary requirement of the Train Control Board of the Interstate Commerce Commission to which as won state, the seven hundred Commission, to which, as you state, the seven hundred and four devices submitted in the competition failed to conform. In other words, this device is designed throughout on the closed circuit principle, so that the tarvugatur on the closed erreint principle, so that the failure of any part is self-detecting. Moreover, this system appears to conform to all the other requirements of the Train Control Board. An additional feature see span Control Board. An admindual resture of especial interest is that it may easily be equipped with the wireless telephone. It seems to be worth while to bring to the attention

of those interested in this important subject that the competition of the New York, New Haven and Hartford Railroad Company does not nece all the ideas of American inventors. all the ideas of American inventors. It is, therefore, not to be assumed that there exists no system that will minimize the serious disasters which ble F. McHENRY. our rails

#### Mr. Hanna Replies to Mr. Linton

Bit. Harms Replies to mer. Assesses
To the Rditor of the Sensitive American:
It was, indeed, not necessary for Mr. Grant Linton
to explain that the inascuracies in his first lotter on the
subject of Excible fastric serupisne wings were due
solely to a desire for eimplicity. Nor should it be necessary for me to say that this painfully excessive "simplicity" was what demanded my criticism. Simplicity
cosess to be a virtue when it degenerates into have
generalization. Aerodynamics is as exact science, and
it is not nossible to airly improc certain forces, how generalization. Aerodynamies is an axaot science, and it is not possible to airly ignoce certain forces, however slight, or advanged differences of direction, however slight, or say meety "an angle of insidence," without the least indication of what limits the angle may lie in. Such erouties will most certainly invalidate all conclusions. The proper place for Mr. Linton's simple theories was kis private note book, there to remain until be had developed them to an exact, concrete, and practical enough form for public presentation. The majority of the Schwitzer American's readers, I believe, here quite mifferent mental canadity to ae majority of the SCHNITFIC AMERICAN'S readers, believe, have quite sufficient mental capacity to imprehend a much more scientific and accurate pre-ntation of this fabric wing theory.

Aviation is, in these sad days, afflicted with too many Aviation is, in these sad cays, amiriced with too many recking-chair theorists, who rush into print with every wild idea that pops into their heads, and is bleesed with too few men of the type of Langley and Effet, who devoted their lives to proving their theories in their laboratories before talking about them; too few men laboratories before talking about them; too few men of the type of the Wrights and Blériot, who embodied their theories in actual nachines and proved them at the risk of death. God speed the day when the propor-tion shall be reversed! A full half century ago there were almost as many men with impractical flight theories as there are now, but it was not until the coming of

con same or every set of the many sense that we seem are now, but it was not until the coming of meas strong enough to put good theory to actual test that flight become a reality.

However, I do find it necessary to defend myself from unjustifiable misquoisation. I did not, as Mr. Linton sessers, "confess ignorance of the truth of his statement that in both classes of vehicles the best efficiency could only be altrained by altering the length of the obord." My actual words in the issue of May 10th, page 421, are pisla enough. And to this day I have not heard anyone of sormanical standing assert that increased efficiency could be attained only by lengthening ar shorieting enough. And to this day I have not heard anyone of sormanical standing assert that increased efficiency could be attained only by lengthening ar shorieting enough. And to this day I have not heard anyone of sormanical standing assert that increased efficiency could be attained only by lengthening archiveling entry in the size of the second of I snow, of any and designed to change its width from mast to outer edge, that is, its chord. To be sure, if a sail bage out to a deeper entry, fix shorted will decrease slightly. If Mr. Linton means that the heat efficiency san only be obtained by to changing the sembler of the places, why did he not say so? I would suggest that be looked appartment of Measure. Munn & Co. can supply him with a modern diotionary of servicential terms. It is by no measure measure. Munn & Co. can supply him with a modern diotionary of servicential terms. It is by no measure measure. Munn & Co. can an astrophage what for increase the cumber, or rice series. It is been the British plants (Mr. 16,06), 11010 to Smault-Publisher for a wrige of variable camber.

I must be the British plants (Mr. 16,06), 11010 to Smault-Publisher for a wrige of variable camber.

I must be the British plants (Mr. 16,06), 11010 to Smault-Publisher for a wrige of variable camber.

I must be the British plants (Mr. 16,06), 11010 to Smault-Publisher for

than in the design of the sailing yacht," he ought, to than in the design of the sating years, we ought, to be consistent, to put a little more exquisite and scourate detail and less vague and inexact generalization into the exposition of his theory.

Again, I did not "assume that, because the upward

component of the air pressure is uniformly distributed over the surface, the total air pressure is likewise," as Mr. Linton asserts I did On the contrary, I denied such a possibility, and cited Eiffel's experiments as proof. My attitude was so clear that such a glaring mis-statement is difficult to understand. Pictures are generally easier to comprehend than written descrip-tions, so I would suggest that Mr. Linton may best secure his first knowledge of the actual conditions of sir pressure around an inclined place by consulting excellent graphic charts of Eiffel's pressure measure-its that Mr. E. R. Armstrong gives on page 418, vol. iv. Acro and Hudro.

I am afraid Mr. Lanton is jesting when he proposes to subject the two sides of the fabrue to the air flow singly. For certainly the unbalanced force on one side would deform the fabric out of all possible wing pe, and if by any complicated apparatus this result ild be avoided, the conditions would still be wholly different from those of actual flight, and consequently the data obtained would be useless. The lift of a plane is not only dependent on the pressure below and depres-sion above, but on the extent to which these two simultaneous forces are mutually neutralized and destroyed

around the edges of the surface.

I still think that the belief in the parabola as the only correct basic curve for wing sections belongs to the past. The only authority for it Mr. Linton cites is Montgomery. I could name a dosen others, but they are all, like Montgomery, men who theorized in the days before acroplanes were living, everyday reslities, disproving with monotonous regularity one after another our preconceived mathematical theories, such as Newcomb's proof of the impossibility of mechanical might and Navier's mathematical proof that one swallow required one seventeenth of a horse-power to fly

I was aware of Major Reber's comment on the regular d of Vedrmes in the last Gordon Bennett race, speed of Vedrines in the last Gordon Bennett race. But we cannot judge aviation as a whole by the per-formance of one highly specialized racing machine. And I am quite sure that Major Rober himself would never sanction the purchase, for actual army use, of any acroplane that could not show a much greater speed range than this Deperdussin racer did or could

The most absolutely ignorant and erroneous statement of Mr. Linton's is this gen. "Though the ability to vary the speed of horizontal flight within wide limits to vary the speed of nonzona lagne within wide units is a most desirable quality of the aeroplane, 'this feature (as attained at present) is only a proof of poor design, or at least of inefficient running." I must gently but or at least of mefficient running." I must gently firmly decline his offer to inform me that "the bip is by no means acknowledged the most highly specialized type of the heavier-than-air machine." The biplane has been developed as far in its sphere as the monoplane; it is a type that is here to stay; and it is, for structural reasons, the type of the large unchines of the future. It flies by the same processes, and obevs the same laws, as the monoplane does. Consequently, facts proven by it cannot be ignored. However, if anton prefers data derived from monoplanes, 1 call his attention to the performance of the Hanrict, Blériot, Bristol, and Deperdussin monoplanes in the British military trials These machines showed speed ranges of 25, for cent, 47.3 per cent, 25 per cent, and 26 per cent, respectively. To take a more recent instance, at Villacoublay, on June 21st of this year, des Moulinais obtained a speed range of bottom of the Moulinais obtained a speed range of bottom of the Moulinais obtained as speed range of bottom. monoplane, while (lilbert, with a 50 Rhone machine of the same make, obtained a range of between 4134 and 7334 miles. In every case these ranges were the product of the deliberate efforts of some of the world's ablest designers and pilots. Mr. Linton should be familiar with the experiments to increase the speed ar with the experiments to increase variation of a Farman biplane which the National Physical Laborator of England has just concluded as successfully. Does he access that honored insti-tution of poor design? The fallacy of flexible fabric, whether for actual wings

or as a means of ascertaining the best wing curvature. is at once evalent if we will remember that the object of a wing is to deform the air in the manner most adus to us, rather than to permit the air deform the wing in the manner most advantageous to it. Anything that favors a certain motion must necessarily be unfavorable to the equal and opposite reaction.

In these two letters I have said all I care to on the

subject, and I believe that Mr. Linton has made nosition clear also in his two letters. I suggest, then, position clear also in his two letters. I suggest, then, the case should now be placed in the hands of the jury. Let us have, through the columns of the Scientific American, the opinions of others, perhaps better qualified to judge than either Mr. Linton or myself.

Galveston, Torga. John G. Hanna.

# Buying and Selling Silver and Gold

The Scientific Side of the Assay Office at New York

By H. J. Slaker

THE public has practically two relations to the Assay Office at New York; first, that of selling gold and silver to the Government, and, second, that of buying both of these metals from it. With some exceptions,

the Government buys any amount of gold from any individual and page \$20.07 an ounce for the gold contents. If the deposit contains silver also, it is either paid for at the market price, or its equivalent in fine silvers is returned to the deposite.

wer is returned to the depositor. The purchased deposit may represent the product from a mining company, dental scrap, an import of gold from Enrope, or discrated jewelty. If the fewelty could tell its history, one might bearn many a story of poverty and proken pride, for many times old family helricoms, or even interole emblems, in chased gold and silver, are handed in at the window of the Assay Office. The very day these deposits are received they lose their identity, for they pass immediately hird a cruelile, are melted and cost into the form of an uniliteresting ber. The Government accumilates a great variety of sizes of bars, having many different finenesses.

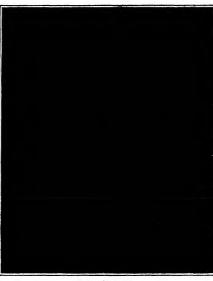
When the justile wishes to buy gold, it demands its product satisfies the every particular for the various trades which utilize this metal, and the high gride metal produced by the Government meets these demands. It may be the dental profession wishes material for filling teeth, in which case an exceedingly high grade gold is desired, since a trace of lumprity latter-frees with the cold welding. Or again, the gold beater's husdiness demands metal close to absolute jurity, so that the leaves may be isomeded to an exceedingly great thinness. The Jeweel'er strade is not a fastise of the control of the

from the public and the selling of pure gold to the public, there is necessarily a series of operations, which is known as refulng Several different processes of refulng have been in use, all of them open to some objection, such as fumes, great cost, or excessive loss of the precious metals. The electrolytic method, after an extended test of several years, has b installed in all the Government refineries. In principle, this is a plating process very much resembling that of sliver and gold plating, with the exception that instead of a smooth deposit, which appeals to the eye, a deposit of quantity and purity is obtained. In actual practice the anode is a bar made from the different deposits, sultable in fineness and form for the process, while the cathode is a thin strip of pure metal upon which the deposit is anthered and is of the same metal as the deposit So long as certain conditions such as voltage, strength of electrolyte, etc., are kept constant, nothing but the desired metal will be deposited. Port of the duties of the working force is to keep

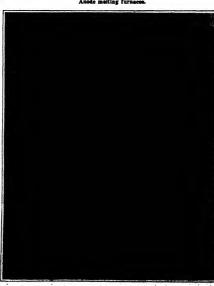
The operations are divided futo two parts, known as silver retining and gold refining, and while they more or less overials, they will be considered in this order. Silver Refining.

Practically all deposits under 900 fine in gold are sent to the silver refinery, while those above that go directly to the gold refinery. The silver anodes (3 inches by 16 inches by 8, inch thick) are made directly from the deposits received over the counter and are alloyed to one another so that the resultant melt will be kept within the following limits: gold, 250 to 400; base, 128% to under; and remain-

ing parts sliver. To keep within the limits mentioned, this selection of the various deposits requires much patience, because of the great variety of the weights and finenesses, but by constant practice one becomes expert in this detail. The necessity of bandlings



Anode melting furnaces.



Dectrolytic said cotts.

much as 150 parts base and also such a large partion of gold makes the electrolytic method difficult. cupeling treatment has been suggested, but the low of gold and the great values tied up in formaces are to problibit this. Each anode is put into a musical

tied at the top and suspended is the altrolyte by means of a small seek his The hook passes through a hole small the time of casting, in the top of anode and is hung over the condured. The conducting rod is companied a hard rubber tube reinforced chavitan is center with cold rolled steel. The altric current is carried by means with this strip of silver which is half-round over the hard rubber tube and fastended tape at each end. It will be noted that both gold and silver are used to early suirent; this is because they give good content and not corrode.

The cells (brown stoneware, 2 feet by 4 feet by 2 feet deep) are arranged in two sets of streen in series, placed close together on scapsions slales of proper height The eighteen supporting rods for each cell are spaced 2½ inches spart and this distance is maintained by hard ruber separators placed on the rims of the cells. Each supporting rod is double the width of a cell, so that one rod expende over two cells and serves the purpose or an anode support in one and a cathode support in the next. This plan slower the cells are the next this plan slower the cell, carrying a total of 43 anodes and an equal number of cattode rods for each cell, carrying a total of 43 anodes and 43 cuthode uniformly distributed. A glass propeller in each jar, driven by a motor-operated belt, gives the necessary circulation to the electrolyte.

The electrolyte contains 3 per cent

The electrolyte contains 3 per cent silver nitrate and 2 per cent of free nitric acid, and this strength is maintained by adding either acid or silver

The action of the electric current is interesting, for in passing from the anode to the electrolyte, it dissolves diver and bases mental, leaving gold in the bag as a coherent apongs mass; and again in passing from the electrolyte to the cuthode, the electrolyte to the cuthode, the electrolyte and plates out nothing but the silver. Thus a satisfactory separation is under between silver and gold at the nuclea and between silver and base metal at the cathode, while all the component parts of the original guade are in a state to be relatively easily regular.

Every eight hours each cathode is lifted out and the loosely adhering aliver crystale are accepted into a vat, washed, and then intelled into merchant bars for the trade. This is the fine aliver product of the refinery. Some of these crystals fall to the bottom of the tank and are regained at the time of the removing of the electrolyte. If the measurary care is exercised, the result is very merty pure silver, not containing more than a half part in a thousand of foreign metals. The gold contents of this deposited either are watched carrelly and not allowed to exceed two parts in a hundred thousand. Just how this gold flood is tway into the silver is mixing the production of the silver is mixing the product of the silver is mixing the product of the silver is unknown, but it is believed it is introduced mechanically, rether than chemically or electrically. However, said, platinum wise palasitum can be found in the foul electrolyte for exceedingly small simounts. On account of the requisity which the electrolyte becomes fool and the necessity for "sewring", the Prognastity, abard rother constributed "pump sensores the actions, of the freeze, it is freeze, it is

come metals which are precipitated by it in the form of stillne, which is washed, melted and passed through the electrotytic process a second time. The solution their which the after has been precipitated is allowed so rein of to the sevier. The low current density of weigh amperes per square foot is used in order to pre-regar the been metals from plating over with the sliver, and also in order to obtain a more cobert erystal form.

est irrystal form.

When the spongr anode gold is 'remoyed from the bags the aliver has not been doughedly extended by the spongramed from the bags the slower than the spongramed from the platform and palledium remain with the gold and are regalated further along in the process.

The gold which comes from the anodes of the silver refining, tower with the gold to the comes from the anodes of the silver refining, tower with the gold which comes from the anodes of the silver refining, tower the with the gold which comes from the anodes of the silver refining, tower they will be gold to the silver refining, tower the with the

of the silver refining, together with the gold in the original deposits which are goan in the original deposits which are high enough in fineness to be suitable, pass through the gold cells. These cells (14 inches by 19 inches by 12 inches deep) are Royal Berlin porcelain because this wate withstands the chemically active electrolyte. The general arrangement of the gold cells and the conducting rode is mewhat similar to the sliver system se hard rubber rods are covered with s thin strip of gold for carrying the current and the circulation is obtained by hard and the circulation is obtained by hard rubber propellers driven by a motor. The electrolyte is composed of 50 grammes of gold as gold chloride to the liter with some free hydrochloric acid. The anode (8 feet by 3 feet by 4, foot binks) is slightly wedge shape in order to prevent the bar from being eaten off near the sur-face. The portion which remains above the solution has a hole near the top, is reduced in thickness and has corners cut reduced in thickness and has corners cut off. The silver contents of the gold anodes, if above 5 per cent, form an insoluble silver chloride conting which pre-vents the solution of the anode and stually gives off chlorine gas.

It becomes necessary to remove this coating either in some mechanical manner, as scraping by hand, or by an electrical device. The latter device is now ing used with a fair amount of succe

An alternating current is run in series with the direct current, the resultant wave being a pulsating current through the being a pulsating current through the ceils. Its principal effect is to keep the anode clear from the insoluble silver chloride, but it also issuess the amount of free hydrochloric acid necessary and re-duces the amount of gold in the slimer. An effective current density of 70 amperes per square foot is maintained, which is increased if a higher anode fineness is us

There are four sets of twelve cells each laced upon sometimes slabs at a convenient working height.

The slimes and the electrolyte contain all the metris which were in the anode, and it is in this solution that most of the platinum and palladium gradually accumulate. When the solution becomes foul, the platinum is precipitated by sal-ammoniac as platflum ammonium chloride.

An excess of sal-ammoniac is used and the surplus serves, after an oxidizing treatment, to throw out the paliadium. The solution from which the platflum has been recipitated is syphoned into a clean jar and some potassium chlorate with a small amount, of potassium permanganate is added. This throws out the red sait of palledium ammonlum chloride.

The by-products of platinum and palle-dium are sold to the highest bidder and the proceeds are added to the United States Treasury.

The silves are washed and the silver chipride reduced by metallic sipe, and after adding a certain amount of allver they are cost into anodes for the allver cells.

are past tato, anodes for the alver cells.

The guittment of the deposit meeting.

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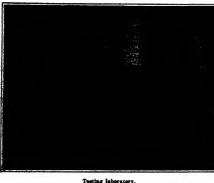
"It has been the section of the fuel oil." It is a section of the section of

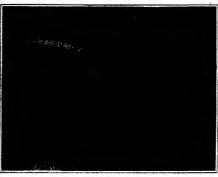
uid be possible in case of a severe so do all the melting by gas in this particular room.

The benches, dumping pans, settling tanks, etc., have all been made fireproof: that is, there is no wood in

their construction.

A special lead-lined from tank with a pan and was ing sink above was installed on this floor with its





Sweep-handling machinery



Electrolytic silver-colls.

ding to's large settling tank in the basoverflow Fundang to a major menting task to appear this system of traps practically insures against a many market which run to the sewer to be free from value. The pressure blower system which gives air to all the furnace, in the building, and has given perfect satisfaction, is rather different from that somerally in use for similar purposes. It is known as a centrifugal compressor and has a rotating element mounted upon the common shaft with the driving element of the motor. This eliminates all gears, belts, chains, etc., and the compressor runs the same speed as the driving The air pressure is constant through all loads and the power consumption is proportional to the load.

The melting room of the meiting and refining department has eight standard oil furnaces arranged around a square, and with the necessary tanks,

pans and benches, furnish the equipment of the room. The square, which is in the middle of the room, is built of firebrick and so constructed that it constitutes a settling chamber with the outlet leading from its center to a large fine off to one side. The flue is vertical and connects all furnaces throughout the building to a large settling chamber on the ninth floor. The construction is such that all fines and ing chambers can be easily cleaned and the values obtained from the dust.

The standard furance is so built that the burner looks directly down in the combustion chamber, which arrangement puts the blow torch flame against the bottom firehrick instead of the crucible, as is usual in many of this type of furnace.

The make-up room and office occupies the other half of the third floor and contains the necessary working desks, iwo large scales, one long table with stone too covered with teather, and the working vault. The vault has a lowering platform before the door, which allows the floor level of the vault to be the same as the room. The vaults throughout the building have the same construction, and this has proved to be of great value because it allows the heavy trucks to be wed in and out easily

The sixth floor contains the shop and the electrical dynamos for producing the proper current for the refining cells, the witchboard and controlling devices The three low-volinge machines are separately excited from an outside source and are so connected through the switchboard that any machine can be used on any circuit. The nuchluss ure duplicate, and each is capable of producing 1,200 amperes at volts, but only one is run ut u timo.

The third machine was specially built to produce the pulsating current by placing an alternating current in series with a direct current. This is accomplished by mounting on one bedplate four machines, a driving motor, a direct current dynamo. phase atternating current dyusme and an exciter. One lead from the alternate passes directly to one lead of the direct current machine and the other two leads go to the gold cells

The controlling device is unique because of the fact that the 110-volt exciter ex-cites the fields of both the alternator and the direct current machines, but with a ud rheostat in series with each, thus allowing a relative adjustment of votinge The fields of the exciter itself are excited by an outside source through an adjustable rheostat This complete arrange gives the necessary large range of nd-justments to suit every condition that might arise. The value of this combina-tion machine is, that it allows the use of es containing a greater proportion of silver, does away with the necessity of heating the electrolyte and makes a slime containing a less quantity of gold

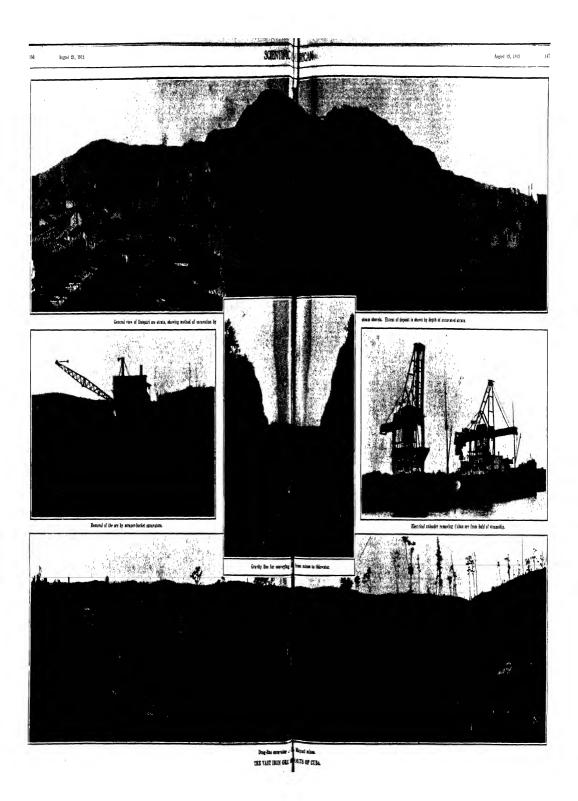
The low-voltage dynamos have a graphite composition brush and a device that gives a series of end thrusts on the end of the shaft, which prevents the brushes from wearing tracks in the com-

The shop proper contains a lathe, drill press, shaper, emery and grind stone and several smatter muchines, all of them operated by individual motors. The rolls for making cathodes are located on this floor and are driven by an atternating cur-rent motor. The idea has been to place

all possible machines on the sixth floor so out of seld fumes, and this plan has given all that was expected of it.

The seventh floor has been given over to the silver cells and the precipitating tanks for the foul electrolyte. There are two circuits of vertical cells, each series containing 16 jars placed on a long table built of brick topped with soapstone slabs. The slabs are counter-

(Concluded on page 153.)



#### Cutting Keyways in a Lathe By William H Trueman, D.S.

By William Bt Treeman, D.D.S.

This f it wining method of key seating by using a lattle as a planer has been found very satisfactory and with alight modifications equally satisfactory for cutting slots. A hock of wood A as 6 by 12 heches and about one inch thick with a groove B to hold the shaft and a hole I for tool post is fitted over the tool post of the silds and held firmly by a tool passing threath the slot in the post and servewed down upon the black. Evo places of wood C at each side of the tool post upperfed by blocks D at one end the other resting on the shaft are festened by boths E pressing through holes E of clamp the shaft is in place. I he block is bolstered up as as to brigg the cather of the shaft opposite the lattle center.



Cutting a key in a lathe

These adjustments accurately made a drill of sulfable size is used to make a series of holes close together and in a row ato gone as the key seat is intended to be an early made of This done the drill is replaced by an order-time of the state of the st

#### Construction of a Water-tight Box

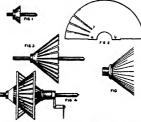
By W A L.

To make a water tight low or trough in the ordinary way requires a great deal of care with the folius but the folius ing method does not ceal! for much skill select an east mind the folius for the seventing qualities and to receive the selection of the seventing qualities and to remain a both adjustment in the seventing to the selection piece first by seventing to the display straight and square. Then make a gage block as shown. The gage block A is 4 inches page block as shown. The gage block A is 4 inches long made of 1 inch stuff. Fasten the block B on one edge of block A with a few light natils and in the center of one end of block A fasten a 20 penny spike as A C. with small staples on with small natil driven in half way and bent over the spike to hold it in place. However, the sevential stuff is a single standard of the three directions of the spike to hold it in place. The spike ( that pu jects should lie at about the carter of the edge. Now starting, at me end of the bottom level hammer the spike ( to form a semi-dreuthar groove Then move the block about 2 inches and strike again and so

ton wicking in the groove with tacks. Now prepare the sides and ends. It is best first to bore holes through the sides along the edge that nails to the bottom. Use a bit about the size of the nails, staggering the holes and boring them about 4 inches apart. Nail the sides and ends on and the box is ready to sill with water to swell it when the water swells the compressed wood around the groove and the cotton whicking it will make a water tight joint. This kind of a Joint will hold water as well as any made with a combination plane

#### A Variable Speed Groove-pulley By F E. Keller

A VARIABLE speed proove-pulley which will conout a hub as shown in Fig. 3. Then make a cone of
heavy sheet iron laying it out as indicated in Fig. 6.
the property of the sheet of the sheet of the street of
heavy sheet iron laying it out as indicated in Fig. 6.
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heavy sheet iron laying it out as indicated in Fig. 6.
the sheet of the sheet of the sheet of the sheet of
heavy sheet of the sheet of the sheet of the sheet
had be long-there in the sheet of the sheet
had be long-there and rived it to the flange of the hub as
shown in Fig. 3. Next turn out another hub and fit
as many threaded apokes into it as there are slots in
the cone setting them at such an angle as to form a
coulcil row of the same antie as the sheet from con-



Construction of a variable speed groove pulley

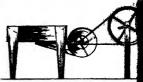
Key one of the hubs to the shaft slip a coil spring in the shaft bring up the other part and put them to gather as in Fig 4 To strengthen the pulley a rim can be put on each part. The object of the spring is that when the pulley is wanted larger the spring works the two pulley members spart and therefore does not injure the belt. Any suitable device may be used to side them together

#### Improvised Forge By Robert K Patterson

HAVING an occasion to use a forge where it was not convenient to carry one along the witter made a very simple one which would do the w it & f a fac 127 made forge in the following manner. In he x if the forge was made of boards. In the bottom of the box a hole two inches in diameter was hered for the int to enter. Then the box was filled in with clay as shown by the dotted lines in the illustration to prevent the boards from extehing first. The blower was con

the cover and in the bottom of the man is opinional was cut about 4 inches in dispeter for the sienter and another hole in the side i by 5 highs the air to escape. The table leading from the bito the box was made of boards having an imids i

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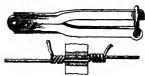


A home-made forge.

nrement of 2 inches in height by 5 inches in a the end attached to the blower. The tube was lowed (so as to congress the air) until if was estimated the was a to congress the air) until if was estimated as the box. At the end of the task amall hinged door was pinced which could be ope so that the sakes, which aftered through the tag from, could be blown out. The turers from in this stance was merely a fint pince of iron drilled full holes. To drive the blower a large grooved wheel mononted upon two posts and connected by belt to pulley on the blower. The inter was fractened upon large paths by fattering a must in all and driving in between the pulley and a spot on the spike that half been field flat so as to form a reds keyway. The shange end of the spike was flattened as much as possible at that it would not turn after it was driven into the wooden conter of the fan. Boited to the bottom of the box were two strips of hardwood about a nich squasie, and about fourteen inches long. To these the blower was boiled on the end of the strips a small froigs atmay was flattened, which had a hole drilled in it to a car as a hanger for the fan.

#### Lineman's Clamp from a Buggy Top By Elbert S Ramsay

By Eibert o generally A I INBMANS champ is a handy but coulty tool the best only a few wires have to be joined. The cut als us one the writer has been using for years and finds it answers every purpose. Take an old buggr too protion one with a good strong joint? Fut a repair link in the short arm. Cut off the long arm where the link will just all pover the end. Now with a file cut two notches on the inside of such arm about



Lineman s clamp made out of a buggy top

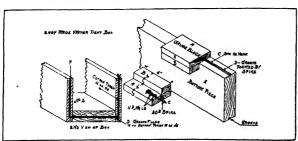
three fourths of an inch from the binge or joint taking care that the notches will be in register when the clamp arms are brought together and that the reac notch is just a little larger than the forward one with a very thin wall between them. You can splice a No 8 wire with sase

#### Workshop Notes

Finest Emery—Having need of some very fine enery for reheding as, sentine valver and having on hand only the sugraded dust from truing up a fine energy wheel, the following operation was resorted to the superior of the fine of the superior of the true may be a fine of the superior of the superior of true may fine the superior of the superior of the control of the superior of the superior of the handfule in this water of course the operation was performed where they was no wind—Joe V, Roman.

Substitute for a Class Cutter—the supportunities happens that when one has to cut glass a giass cutter to not at hand or the one in use is weet; out. The following will make a rood substitute. Take an old, Hisbreak the end and it will be found that one converse will, sussential have a very sheets often substitute. The substitute of the converse of the converse of the converse of the quality is well as a substitute of the converse of the quality is well as a substitute of the converse of the quality of the converse of the converse down but it is nearly necessary to break a small place of the file against and it will be as a simple pass depicts.

T 174 E MATE



Construction of a water-tight box.

on to the end of the piece. The opposite edge should be similarly treated. In the groove thus formed lay a full strand of cotton torch wicking or oakum twisted to a tight strand that will fill the groove use the gage block to make the groove groots the ends and fusten the cot

structed by nailing four pieces of 15 fach board 51/2 by 5-inch to a square woodes tenter The case consistent of a large fand can cut so that it was about one inciwider than the fan There was about 1/2 inch clear ance between the blades of the fan and the case In

#### bilight Signaling for Ballways By Our Biglish Correspondent

n a railway fashilight signaling system is sing efficiency in night high-speed travel. It has d upon private railways siz 1908.

seem upon percent ratiways smoot soon, as difficulty of the engineer is considerable when eding at high speed through a busy junction or autoring a seminal outside of which is a maxedgmal lights. With a flashing light the express

stands out distly and no hesitain te shown in intering the signal. It not advisable to cont all the signals to fashing system, as phalainx of fashing paranta outside a junc-would provoke ter confusion than similar array of dy lights.

.....

The system is simple and economical. The Minminant employed is stored in small, con-venient accumulators placed in a small receive tudle at the foot of the post. No alterations in



The state of the s

post. No successions of the existing signals or system are required. The flashing apparatus, the ingentous invention of Mr. Gustin Dateu, M.E., is mounted in the lamp. Flashes of previously determined characteristics. acter are produced so long as the gas supply lasts. The light after once being started requires no attention be-yond the repleuishment of the reservoir. The system yond the repletishment of the reservoir. The system is so economical that the signal is permitted to work both night and day in Sweden, the consumption charges being less than the cost of labor in switching the appa-ratus into action at dusk and cutting it off at daws.

#### Expanding Socket for Screw Spikes By A. R. Marrison

TN order to provide a better hold for screw spikes in rational ties, a Parisine engineer has recently invented an expanding socket. The socket consists of a metal tube threaded both within and without. The socket is slit at the lower end to about balf its le so as to form four arms which may be spread out by acrewing the spike in after the socket has been acrewed to the wood. Thus the socket is firmly anchored in the tie and affords a far betier grip for the screthan can be obtained by acrowing them directly into the wood. At the top of the socket are two diametrically opposed notches which serve, like the slot in a head, to permit of screwing the socket into place, The socket must be placed as close as po The secret must be piaced as close as possible to the edge of the rati base and so the exterior thread is de-lermined by the thickness of the base flaure.

As shown in the section, the depth of thread on the

inner wall of the socket is not uniform throughout. At the lower part the projection of the thread gradually increases without however clumping the pitch. When atting the sockets into new wood, a hole is first bored e necessary depth and tapped, after which the top of the expanding socket is fitted with a mandrel an the socket is then screwed home. As the lower part of the socket is slit, the arms will converge, as indicated in one of the sectional views. However, when the screw spike is screwed into the socket the arms will be forced out, as shown, anchoring them firmly into the wood, so that it will be impossible for the socket to be pulled out. In old ties where the screw spikes have been torn out, in our ties where the serve spaces have been corn
out of their holes, or the wood has decayed, it is merely
necessary to enlarge the hole, and tap it to fit the expanding socket. Old serew spikes can be replaced in
tals way right on the track without having to move the rail or the tie

# A New Neiseless Gear for Motor Cars All almost a year a prominent automobile manufac-turing company has been conducting a series of beets and experiments in search for a type of sear that, would prove both notehess and efficient in opera-tion. The result is a worm here! gear for rear azi-citye, for that the place of the straight herei now so widely employed. The prihetyni advantages profited out for the new works; gear are the elliquination of backtanh and noise-

The principal advantages pointed out for the new volus, pair are the elizatination of issekhash and noise-tions of dispersion. Backlash between two goars re-ceived in the control of the control of the con-trol of the control of the light, a reliting safe is stilling profits in such a man-ric first the spirituies are always in contact, while the stilling modes, desirates a straight, hered or many genera to

principally a rolling one. After a certain amount of principally a rolling loss are wear the spur or bevel gear becomes noisy on account of the backlash. This, however, is claimed to be entirely eliminated in this latest type of gear.

In the accompanying illustration the worm bevel gear shown installed in the rear axle housing in preci the same manner as the usual type. Very little differ is noticeable at first glance between this gear and the older one, although on closer inspection it will be on that the teeth of the worm bevel are curved, as are to those of the plains which is hidden from view by





As expanded by the screw spike.

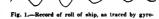
As an anchor for the screw

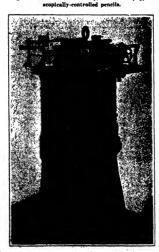
#### Expanding socket for screw spikes



A new noiseless bevel gear for motor cars.

the differential. With the teeth in tids shape it is possible to have one set emmeshing willle the set adjoining is becoming disengaged. This affords a more con-





-This gyre This gyroscopic device records with gracy the roll and pitch of ships at sea.

Land Dr. Grand State of the

contact and promotes a smooth sliding action een the bevel and the pinion

#### A Gyroscopic Mechanism for Recording Roll and Pitch of Vessels at Sea

N a recent paper before the Society of Naval Archi-I tects and Marine Engineers, Mr. Elmer A. Sperry mentioned in a more or less casual way, a device which had invented for recording the rolling and pitching sels in a seaway by means of gyroscopic oechan-

ism. The device is so extremely in gentlous and efficient for the purpose designed that it is believed to deserve more than the mere mention modestly a c-corded to it by its in veotor.

In attacking the prob lem of the prevention of rolling and pitching of ships it is evident that we can go at it more hetelligently if we are able to determine in the first place, exactly how much the roll and pitch of various types of vessels is it is also plulu that la order to measure accurately the

roll and pitch com-nents proper it is necessary to eliminate as far as possible all motions relating to vawing, azimuth move ments and other movements of short periods due to outside influences acting on the shin

"Universal or compound angular motion may be said to be made up of three primary components sindiar to to be inade up of three primary components sindiar to the three primary components of while light and prob-ably from the same basal cause, thus universal augu-lar motion may be resolved into motion about three axes, all normal to each other and bearing the relation of the three converging margins of a cube. Gyroscopes mounted for producing motion records, so far as has been heretofore published, are in each case critical to all of the three above named components. In this manner the rolling record is liable to be fulsified by mottons which really have their origin in yawing. or pitching, or both.

The problem then consists in so mounting a gyrostone as to nake it critical to only one slugle compopent of motion and at the same time to make it have very long natural period as to be entirely removed from any influences of the comparatively short eriods of motion on the ship itself.

periods of motion on the ship itself. This the investor has succeeded in doing in the apparatus shown in Figs. 1 and 2, and by means of a set of ingeniously mounted pencils we are able to record the curves of rolling and pitching for any vessel with a black degree of accuracy. The recorders shown consist essentially of two sets of gyroscopic pendulums, one for recording the roll, and the other pendulums, one for recording the roll, and the other for recording the pitch, and to give the reader a con-crete idea of the qualities of the pendulums it may be stated that they actually represent (due to their high speed of rotation) a weight of 1½ tons hung from a point 10 miles above the earth, thus having a practically infinite period of oscillation. It is by means of this very long virtual length of pendulum that there has been elinduated in the records practically all influences of extraneous motion except that of the one selected component of the motions of the ship, such for example, as the rolling or the pitching.

As may be seen from honecting the photograph, the capitance consists of two sets of gyra wheels, two wheels in a set, about twenty pounds in weight, mounted within a case performing the function at once of a support for the wheels and the precession ring. These wheels are electrically driven by a 3-phase mo-tor mounted within the frame of the machine so as to give to the wheels practically the same speed.

wheels of either set spin in opposite directions and further, precess oppositely, the precession frames being coupled for opposite and neutralized precession There is seen mounted be the lower part of the frame a There is seen mounted in the lower part of the France a motor generator set which receives 125 voits direct cur-rent and delivers 3-phase alternating current. A low electric motive force is used on the A. C. side so that all points of the apparatus will be harmless from the

The spinning gyro wheels are mounted in elliptical stabilized rings supporting the gyro cases on parallel axes, and these in turn are pivoted at right angles to the main frame of the apparatus. The stabilized base the main frame of the apparatus. The scattises may frames are seen to be normal to each other, one responding to all the components of the pilich of the ship and the other to the roll of the ship, and they are prac-

(Concluded on page 151.)

#### RECENTLY PATENTED INVENTIONS

These columns are open to all patentees. The notices are inserted by special arrangement with the inventors. Terms on application to the Advertising Department of the SCHEPTIFIC AMBRICAN

#### Pertaining to Apparel.

Fertaining to Apparell.

HAIR PIN-ell. Jaconsurs, 2023% Market
St. Gaiveston. Tex. The object here is to
provide mean on the hairphi itself which will
automatically engage a portion of the hair
and grip the same, so as to secure the hairpin in position on the hair without danger of
getting lost.

getting lost.

RITTINISION MARKER FOR SHORK—
E. T. ADAMS. Portsmouth, Olho. The present device is an improvement over that shows in device is an improvement over that shows in the control of the desired parties of marking points were simultaneously actuated so as to mark the position of the buttonholes at one operation. The present device has a dmillar armaneum and means for simultaneously alternated points of the significant o



SUTTONHOLE MARKER FOR N

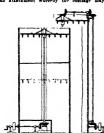
devices in the direction of the line of button-holes. This consists of a morable spreading device while, causes a letteral morremout of the marking devices. Means provide for actuat-ing the spreading device and for locking it in position; also an anvil for each marking point with means for holding the anvil during the operation of the marking point.

Of Interest to Farmers.

CORN HURSER — G. L. MILLER. Geneevo.

III. Address Charles G. Davis, lawyer, Limb
Building, Geneeco, III. The object here is to
provide a hand device which may be estally attached to and detached from the hand of the
user, and by means of which the hunk may be
readily torn from the ear, without injury to
the hand or strain thereon.

FRED DELIVERY ATTACHMENT FOR SILON,.-- M NCOTT, Edna, Tex. The present invention relates to Silos, particularly to an attachment whereby the onsinge may be



PEED DELIVERY ATTACHMENT FOR SILOS.

delivered therefrom as it is desired for us without necessitating the climbing of the sil and entrance thereinto for this purpose.

SOUTHERFOLD LADDER -- G G Southempton N Y An object here range improved means adapted to is to ar



ously adjusted and rearranged for accomplishing a pinrality of purposes, all of which relate to the use of scaffolding of various kinds Further, to provide a Scaffolding device formed

of two members connected by a pivetal Hak-and carrying braces for holding the supporting members a proper distance spart and locking support and the support and the supports designed to support carefolding bars. The lad designed to support carefolding bars. The lad der proper may be send in various acceptation as a support for easefelding in ladder, and as a scalfolding support for use on roots of various shopes.

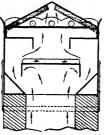
roofs of various shapes.

VAGINAL SPRCULUM.—L. DROSH, Manhattan, N. X., N. Y. This Instrument combines in a single, reitable, efficient device the functions of previous case, with the result that not only may an operation be more quickly and easily performed, but a sargeon acting alone is smalled to perform operations which now commonly document the co-operation of one or more assistant and with avoidance of gain.

is sanished to perform opprecions which how commonly dound the co-speciation of one or our content of the conte

such hars.

CHIMNEY CAP.—J. E. McCall. Montgomery, Ala. The particular purpose here is to provide a cap having a comparatively simple form and provided with messan for facilitating the except of smoke and hot gases, while providing the "sind from hiswing donwered by into the chimney, and you allowing the sind provided with messan for the chimney, and you allowing the sind provided the sind purpose the



CHIMNEY CAP.

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critismest cap. Provision is under for arrotting and returning a portion of the coot, again, and analogous matter, we that each capital continues and analogous capital, and analogous capital critismest, also means are provided for trapping and hadding such materials as are carried neward with smoke and hot games passing through the chinamy for further combustion.

CMMERA ATM COMMENT, S.T. The wore particular purpose of this invention is to examine a commera to be adjusted for taking pictures of different sizes, the size of the picture-sheig controlled by the amount of tim surface exposed, and this being adjustable at will with-left the composed, and this being adjustable at will with-left the composed, and this being adjustable at will write.

POLLING UMBRIGLAL—I. P. Cassicowop, B. L. and T. Nessatisia, capy of iast, 1796 Full-ion R., Brockling, that is to any, subscaling contracted that the sticks may be short-level as of that it may be capted in a suff cass.

MOLD FOR CHEMINY POSTS—1. B. Home, 1611 W. 1848 B.C. (Melsberg, 6016. The

brells so that it may be correct in a suit case.

MOLD FUR GREMET PORTS.—1. B.

Home, 1611 W. 14th Sc., Okinkens, Okin. The increase has considered a modding species which, increase has deviced a modding species which, were a best-board, may be innecediately to-Address the spring, SSZ Avingthur Abs. This work is best-board, may be innecediately to-Address the spring, SSZ Avingthur Abs. This writer is best-board on any occurrent process of the door or Amager and passettilly considerable depress. Thus he is able to modify of a gustary site of "arthridges" possettill of "any occurrent processing and the control of a gustary site of "arthridges" possettill of the door of Amager and passettill of the door of passettill of "arthridges" possettill of a gustary site of "arthridges" possettill of

to rapidly, so that they may

at timparatively small cost.
EVA-PURATION APPARATUR.—D. Committee, R. O. Box 466, Monunciate, Cal. The investion relation to apparation for distilling, incodensitie, evaporating or distilling, incodensitie, evaporating apparatus artifacts that some desiral select is to provide an evaporating apparatus artifacts and time to the committee of the

apparatus.

SWINGING PIPE JOINT.—W. KIRKWOOS

300 M. 17th St., Pittaburg, Kan. The improvement is in swinging pipe joints, and the pur pose is the provision of a nimple device, especially adapted for use is making a Sentile connection between two sipe three, without the use of heep or exametrions of fairful mate CUSPIDOR COLLECTOR AND CARRIER.

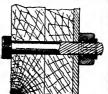
CUSPIDOR COLLECTED AND CARIER.

W. A. NELLON, \$84 W. 124th St., New York.

N. Y. The purpose here is to provide a cuspiloga, hotels and earlief for tue in offer brildlogs, hotels and other places, and arranged
to permit of reskilly calleding a number of
cuspidors and safety earrying the same toditunt place for washing and other purposes. distant place for washing and other purposes. VACUUM CLARAING APRATUS—E. B. DIWN and A. F. DUN, 10 Hanothoras Phee, E Orange, N. J. In this case the purpose of the invention is to provide a new and impreced varuum cleasing apparatus, arranged to spin insticatly insure a continuous operation with a view to draw in the dust from the nesses at view to draw in the dust from the siltend dust.

Hardware and Tools.
TOOL HolloML—II, Carry, cere of Dr.
Charles E Pannet, Bi Trumont St., Glovers
vitic, N. X. This invention relates to lathes,
and its object is to provide a new and in
proved tool holder arranged to readily accommodate different forms and sines of turning,
more of the state of the state of turning,
more of the state of the state of turning,
more of the state of turning,
transported and turning the desired as not a pluraity of sections movable longitudinally of one
another. There of the state of the state
for measurement in closed or extended position.

for measurement in closed or extended posi-tion. PVPR VISB.—T. Enamon, 414 Midnard AV., Syracure. N. T. Than invation relative to the property of the property of the pro-used by plumbers, pipe fitters and the like, and wherein the upper or shifting jaw is at tached to the operating serve by a serviced connection. The principal object is to im-prove the serviced connection between the operating serve and the movaline jaw. NUT LOCK.—I. R. HICES, Hallevilla, Mo. in the prevent partent the investion has ref-tained to the property of the prevision of a simple and strong construction of a ser-ticed in which the locking mechanism is not lock in which the locking mechanism is not



only self-tightsolng, but in case of the beit stretching slightly, the parts will automatic-ally assume their relative positions, thereby enabling the locking mechanism to obtain a new arty. The surarving shows a longitudinal section through a bolt provided with the im-proved out look.

FASTENER.—F. M. STINGER, 12 Cle-t., Busberr, Coun. The object of this ion is to provide a new and improved fa or use on tise chains, logging chains.



fasturers and minitar devices, and arranged to take up all stack is a firstlibe commercion, to security fastes the parts together and to re-lieve the javet of the commercing lies of un-

FURNACE,—U. W. -Sensor, the improvement makes assort that close of increases built sections. It provides a turning able parts having a relative, parts in proportien to this a subjected to the heat. Means a inting the volume of fire, in t also an automatic regulator to

Mousehald Tellishes.

RED.—T. H. COLLIN, Grantes Sais, Ellis The purpose of the present invention is a wird of a false ceiling part which is adapted it to the present invention is a wird of a false ceiling part which is adapted it in the part of the present in the present in the part of the present in the part of the



by to form a lap-board. It provides a table capable of performing functions such as out-lined, the folding and adjustment of which may be easily and readily accomplished and which will be strong, durable and compara-tively inexpensive.

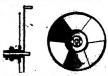
Intelly Independent to the second and complete. WORK SRINGLI-J. P. MAGAET, 160 H. 197th Re. New York, N. Y. This travaster by anhesittening a metal arm and wedge for a regular vise, is eachied to produce an effective household portable work-bender consulting of that two pieces, top and side. Light, powerful and lar bench is not available and is capable of the lize tipdity damped in a wide variety of situations while coccupying a minimum of space when not in use. It is advertised in the classified ad. column

Manshines and Mechanical Devices.

PAPBR GUIDR—ALICE U. Davis, 481
Capies Sidg, 281 Pass, Tex. The greenst invention relates to improvement in construction of paper guides as disclosed in a patent
of the U. B. nombered 1.040,001, greated to
Alice U. Davis. The principal object of the
present investion in to provide means whereby
the guide may be folded whan not in service
pedicion. to prend coverting the typewriting
the guide may be folded whan not in service
pedicion. to prend coverting the typewriting
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the numai manner.

SHUTTER FOR MOVING PICTURE MACHINES.—W. P. McLIVANIS and W. S.
QUINST, Bellingham, Wash. The invention an improvement in shutters for moving picture machines, and has for its object the prevision of a simple, smally operable device for



to existing machines without their chart to existing machines without other char than recording the shutton. This improvement may be used with, may maintain of the cha-ster in question, and extinent, any char-in the machine, wasses

ADVENTURE COMMISSION OF THE STATE OF T

Control of the Contro

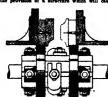
ALL POUCH PASTENER KAIL FOUND FARTENTER—J. E. Server, & Cache be Founder St., Colorade Springs, — The intention here is to previde means instance, the control to the until poseth, and generated the metal poseth, and generated and orwanged that the te-ty may be ensued to encircle the gathesed of the punch and the fastening means followed the colorada of the colorada of the best properties of the colorada of the best properties of the colorada of the punch and the fastening means of the colorada of the colorada of the colorada of the colorada of the description of the colorada of the color

"Differ—G. Durwen, Side H. Svih St., Cal-d. Cil. The object of the present inventor. to provide a new and improved jump strong-pendigned to utilize air as the motive pow-tal to be automatically operated thereby patimapously as long as the water is permitted

for them. The value is parasitive for them. The size of the Concords, Paris, Praces. This substantial miles in of the kinds that are adapted to its sundered to the bottom of the adapted to its sundered to the bottom of the concords of the contract of the concords of the concord of the concords of the

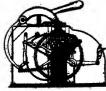
the urial.

The urial the urial that Rus 200 E. Sandasky St., Bulletontation, Ohlo. This investion relies perfectivity to chapths rings designed to other states and the urial that the ur



the cutting or planing knives to follow a cer-tain shape or form. It provides a pair of guiding rings on a cutting head to se to guide various shaped forms as the same pass over the cutting head whereby the knives mus-shape as article necessing to the forms need. n an article necessing to the rorms user.

AMPING MACHINE.—J. W. Tuner, Stiusts St., Sun Autualo, Tune. This mais more especially designed for use in



STAMPING MACHINE FOR SAME

rallering statest selliers for accumulate administrative fathering states are their faces with the father and the state of the state of

ACLIAN CONSTRUCT. COMPRESSION OF SECURITY AND ACCORDANCE AND ACCOR

Marchar Charles

TARY BRGINE G. La. Mr. Snead's inv



BOTARY ENGINE.

proved reversing mechanism and with sliding abstincests of special form and controlled, to gether with movable guides coacting therewith, and also with reversing valves to reverse the engine by practically a single manual move-ment.

INSTALL COMBINETION CONTINUED TO INTERNAL COMBINETION ENGINEER—H. BRICHE, Millstone, N. J. The juvenation relates to cortain improvements in that type of igniter in which a small quantity of the explosive mixture is compressed in an auxiliary cylinder to such a pressure that it automotically justices and serves for the ignition of the main charge in the working cylinder.

der.

BOTARY ENGINE.—B BRINTSON, deceased;
Mets Benison, executit, 1888 Ave. N. Gaiveton, Tex. The purpose here is to provide a
rostery engine or pump having rines for engaging the sides of the wheel near its periphery,
to pervent the full under pressure from seeping toward the axis of the wheel, so that its
full power may be exerted on the impact faces



BOTART ENGINE.

of the buckets spaced apart on the piston wheel between the sides which are entaged by the packing rings. The engine casing is previded with eochs for indicating any escape of the field in the direction of the axis of the wheels, so that, when necessary, the packing rings may be additived to prevent further escape of the field.

cape of the first.

N.I.IID EXPANSION ENGINE...J. I. PonTOUL, decreased: Leina A. B. de Foctoul, trater, care of Julian A. Arroyo, S. Wall Rt,
N. N. N. This invastion relates to an crpassion seafine of general application, and
more particularly it relates to that form of
bast sugitie which depends upon the expansion
of a finid as its actuality, sending. The har-



the production of power, but has a uses applicable to the arts of to-day

#### re and Their Ac

Ballways and Their Accessories.

BAIL JOINT.—J. E. FOOTS. 516 E. Sth St.
Topeks. Kan. This investion enables contrac-tion of the rail on the general direction of the length thereof to tighten the joint; enables the weight of the rail and downward pressure of spikes associated with the rail to tighten the joint; provides means for preventing separa-



BAIL JOINT.

tion of various parts composing the rail joint, and generally to reader the joint as far as practicable self-tightening; avoids user boths and analogous fastesing members erecept in instances where desirable to use the same; and improves the general efficiency of the rail-solid. Worristance, 1,200 64th Av., Oskiand, Cal. In the present patent the investion has reference to a switch in which manually-controlled means on the car serve to eagast derives heat ed in the tract to throw the switch element in each of the control of t

which PRNDER\_G. Mellino, 309 Vander-blit Mt. New York, N Y. This lowestion pro-vides a fender, the operation of which insures the lifting of a body from the ground when directly in front of the vehicle to which the fender is applied; provides neas whereby the lody is deflected laterally from the gath of and vehicles and away from the carrying wheels



CAR FENDER.

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CAR FENDER.

CAR REPLACER.—W. H. WARD, 13 % Gren
Rt., Cumberland, Md. The design in the location of the foother of the foother of the foother of the foother in lowered position and the residued.

CAR REPLACER.—W. H. WARD, 13 % Gren
Rt., Cumberland, Md. The design in this instance is to previde a car replace comprising of the foother of the fo

Fertalating to Herrestion.
DETONATION DEVICE—I. J. Histor., care
of Asher Kleinman, 200 Bighth Nr., Manhattractic purpose, and the oblet of the laretion is to provide a construction in which all
dampyr in the use thereof is eliminated. If
the cape are dropped anywhere and waited
on, no accidost result. It can be used also
no accidost result. To can be used also
convene should need to summon help in the
night time. oleht tie

night time.

ARTIFICIAL FIRH BAIT.—C. W. LANE, Madded, N. Y. The invention is an artificial minnow having side or perceived fine advantage of the control fine adapted to be oscillated vertically so as to simulate the material minnow, the oscillated being effected by soilable connections of the fine with a longitudinal shaft having a tail spinner which is rotated by firtition with the water as the minnow in the material through the latter.

ride a si

provide a simple, strong, and succeive measures ism for the purpose mentioned.

DEMOUNTABLE RIM.—W. J. LANK, Youngstown, Ohlo This invention relates to demountable rims, and refers particularly to the class comprising a fixed and removable rim



DEMOUNTABLE BIM.

mutually engaged and means for keeping the same in predetarmined position and affordings an easy and rapid separation of the same. An object is to provide an inexpensive and reliable rim that can be easily mounted and removed from a vehicle wheel

reliable fin that cut no easily monuted and removed from a while wheel water CARL. Plattic WHIREL, which is not to provide a wheel to which the assessary resilinery is secured by means of a number of aprinar, these springs taking the place of the ordinary passumatic tire and having similar functions to it. A series of orphina is provided, the ends of which beer rollers, thereby eliminating frie of which beer rollers, thereby eliminating frie Pointra-Rais. But POINT AME. BUTPOINT AME. BUTPOINT AME. BUTPOINT AME. SUPPOINT AME SUPPOINT

DESIGN FOR A HOLY WATER FONT.—
T. LLOYM. 40 Northfield Mt., Rosion, Mass In
this ornamental design of a holy water fout
the front 'tem presents the Saviour on the
ten of the present the Saviour on the
and the rear presents the Virgin centered in
antiti-pointed design. The form of the foot
is high and somewhat harrow, the whole producing a very beautiful effect.

DESIGN FOR A MONUMENT.——F J DAYIN.
craw of Davis Brox, west Revin. We in this
ornamental design the monument inside ele
perspective view above a broad thick square
on a base, the front having a circle for inscription and bordered with ornamental designs.

DESIGN FOR A DUSTING CAP——I \*\*\*——.

Nora.—Copies of any of these patents will be furnished by the SCIENTIFIC AMERICAN for ten cents each. Please state the name of the patentes, title of the invention, and date of this paper

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# The Ten Greatest **Inventions of Our Time**

We hear much of the great inventions of the pastthe telegraph, the sewing machine, the telephone, the reaping machine, photography, Bessemer and open hearth steel, the steam engine and the phonograph. Yet the inventions of our own time are as epoch-making and as dramatic as these.

Perhaps because we have become accustomed to the use of the old machines and discoveries, perhaps because the achievements of latter-day inventors succeed one another so rapidly that we are not given much time to marvel at any one of them, we have not fully realized how stirring and wonderful are the products of modern ingenuity.

Only five years ago the man-carrying aeroplane made its first public flights; only the other day hundreds of passengers on a sinking ship were saved with the aid of wireless telegraphy. At least a dozen inventions as great have been perfected in our own time, and all of them have made a man's work count for more than it ever did before, and have made the world more livable than it ever was.

Why should we not tell the story of our own deeds? Why should we not review the industries created by men who are still living, men whose names will go down into history with those of Watt, Morse, McCormick and Howe?

Tha was the underlying idea of the November Magazine Number of the Scientific American. We knew that the "ten greatest inventions of our time" was a big subject when first we planned the number, but how big it was we never realized until we surveyed the field of modern invention.

Then we saw how astonishing was the progress made in our own day, how much mankind had benefited by the inventions of great modern intellects. We began to appraise inventions, to weigh one against the other, and to determine in our own minds which ten had contributed most to human progress and happiness, which were really great pioneer inventions, and which merely remarkable and valuable improvements on successful past conceptions. There were so many achievements to consider that it was hard to arrive at a definite conclusion.

The upshot of our own thinking has been to leave to our readers the decision

# What Are the Ten Greatest Inventions of Our Time. and Why?

For the Three best articles on the subject, the Scientific American offers in the order of merit, three cash prizes:

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Write for the Conditions of the Contest.

#### Teaching from the Child's Point of View

and from page 141.)

ot add to our knowledge, though he is cile in new combinations, and in any facile in new combinations, and in any case, only that man can be original who can cut himself loose from current associations. He says that there are the sys-tematizers and critics, predominantly synthetic and analytic, respectively, but the highest degree of intelligence possesses great power in both synthesis and an-

In his study in connection with the intelligence of over 800 pupils Meumann found that not infrequently very bright found that not intrequently very origin school children show a slow immediate reproduction, whereas less intelligent pupils exhibit a quick and fitful repro-duction, showing less capacity of mental effort, and indicating less attention to the content, together with a tendency to ward iess resistance in reproduction. He concludes that wealth of imagery

and originality of reproduction however, any departure of the subject from the type proper to his stage of the ent, are characteristics of intelligence. Dull pupils reproduce, e. g., wore frequently named together, and depend much on what has been learned at school for the material as well as the form of crete as that of the bright child. pupils also use verbal imagery to a larger extent than bright pupils, thus tending to approximate to the adult type of thinking and consequently appearing in this regard precocious. His results show that the degree of mental development of puntly is excertained by their capacity of abstraction, and can be recognised by their retention of abstract words, since such retention is mainly dependent upor their ability of understanding the words He asserts that the positive relation be emory and general mental pro iency of pupils is very striking.

On the basis of the present writer's experiments in the Zürich isberatory popular notion that the child's memuperior to that of the adult, because the experiments show that the child nee re time and more repetitions in n Thus, an adu izing than the adult. seded 10 repetitions to mer nse syliables, and a school child needed 63 repetitions to memorise the same series. Of course, there is a fall-ing off after maturity in the capacity to learn new and disconnected facts, but this inability must not be taken as a characteristic of anything except the con nt of the disabilities of age.

#### A Scientific Study of Children.

In his tests of the memo children alone and when working together e found that the class-room distu influences (the noise of writing, walking about, whispering, the sight of the move ments of the pupils, the occasional word of the teacher, etc.) have no special inof the teacher, etc.) have no special in-fluence, i. e., the pupil shows better re-suits if he works together with other pupils in the school than if he works aione, isolated. These differences in memory for the individual and the common test were strikingly large in cases of th younger children. One day he asked a number of the pupils in case of the in-dividual tests whether they would prefer such exercise in the class or alo cent of the pupils gave the decided answ that they would prefer to do the work in the class-room. In one other experiment tested repeatedly a few 13- or 14-year old-pupils with the dynamometer and his ergograph, and found that in the case of the tests of the pupils separately, with no one else in the r m, the quantity of work was always less than when the

others were present.

In many other of his investigations of the pupils he found great and interesting the pupils he found great and interesting individual differences. But he does not want to push the doctrine of individual differences in pupils to the extreme, be-cause we should thus maket a useasce of education impossible, for estauce usunot



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that affirst perapeted periodicise he made to a gar fundamental rules, and the case where the temperature, for it when the rule for applied that we emandating protected. Measure that when the want new from a wife elementon is to know not so the minute differences between in mi normal pupils as what is true al differences among pupils he found in types of learners in each branch ork, and a knowledge of such type ore important for class teaching than of minute individual differences, means have been devised to deterthese individual differences and cor-uniformities we shall be able to sify, grade and promote pupils scien-ally, and not divide them according s or sizes or school marks, as has suggested and practised, as more sat-Experimental pedagogy would enable us to know what are the and even to the selection on and work of life a trade or profe setf. Chancellor E. E. Brown rightly aid recently that the practical dictum of his new pedagogy is that every large com-munity needs a "clinic" where parents where parents and teachers may receive advice on school "consulting engineer" in edu-

#### Buying and Selling Silver and Gold (Concluded from page 145.)

sunk, making a 16-inch rim around the whole table, thus preventing drops of the electrolytes from falling on the floor. The floor of this room, and the eighth, or gold, noor of talk room, and the eagach, or good, room is made of soapstone slabs, so that any spill of acid or electrolyte does no harm, A centrifugal hand rubber pump lifts the foul electrolyte from the level of the cells to that of the precipitating tanks and for this purpose is much superior to the reciprocating type, as there are no-valves under which small pieces of for-

which, with the exception of the sweep cellar, completes the plant. The gold cells are set on soapstone topped tables. There are two tables, each holding two sets of twelve cells, with a heavy scapstone divid-ing slab through the middle. On the top of the dividing slab, electrically driven runs a light shaft line with pulleys at proper intervals. The propellers are caron wooden arms bolted to the central slab and are driven by a light belt from the shaft line. In cleaning up, the entire top of the cell is exposed, thus riving the man in charge ample space for lifting out anodes and slimes. A large soapstone hood with wire reinforced glass for sides, gives the proper facilities for the treatment of platinum and palladium

A testing laboratory is partitioned off from this floor, in which all the foul solutions are tested for values before they pass to the sewer. The different electrolytes are tested for their strength of acid and metal values and also any nece experimental work done.

The sweep cellar has been put in opera-tion recently and its equipment consists of a jaw crusher which crushes the sweeps to one inch or less in diameter, one mill with 60 mesh screen which grinds the sweeps under water until they are the Hubber Grower's Association will con-enough to pass through the screen to the duct a series of six contests, offering two settling tanks, and a steam drise; prises as follows: First, medals for the The type of unit to a series of the contests. two settling tanks, and a steam drier.

The type of mill is a standard mining where the rells revolve and the mannine where the rolls revolve and the pan ramains stationary. It is of sufficient size so that it will not be necessary to keep the mill in continuous operation, and the men will be available in other

The other constantly agitates the wel with the collection or preparation of planswaps so that they cannot hake on jaid or rubber; fourth, gold, silver and the bodies. One settling tank is dispatly between the collection of the settling tank is dispatly between the collection of the settling tank is dispatly between the collection of the settlement of the collection of the settlement of t

A Gyroscopic Mechanism for Re cording Roll and Pitch of Vessels at Sea

(Concluded from page 149.)

tically free from response to all other ents of motion

The rolling and pitching records are nade upon two rolls of paper six inche in width driven by the same small moto at the same rate. There is also provided a means of marking the seconds on the record, and the center or base line from which it can be determined to which side any particular roll was made. The leve of the records is about four feet from the ment is self-contained and portable. Some idea of the extreme accur-

the apparatus can be obtained from the following report of a test: The vessel on which the machine was mounted was floated in the bottom of a dry-dock, the water being drained down to 18 feet. The w ther conditions were excellent, with prac-tically no wind, and the vessel was al most entirely protected from any outside influences by the sides of the dock. There were used three plumb hobs on lines 121/2 feet long, the bobs being submerged, and the movement of the pencil was constantly checked up by the lines. The vessel was under constant motion and every motion was perfectly apparent and could be eastly recorded. Whenever the boat settled to an extremely small fraction of a de-gree of roll, the center was determined with great accuracy and it was found that at no time had the gyroscopic pendulum of the apparatus moved a hair's breadth This was further corroborated by the position of the levels connected with the pendulum. Interest, of course, centered upon the return of the datum point at the end of the test, and it was fo the pendulum returned to within less than 1/64 of an inch of its original position It was first thought that this was an error of the apparatus, but upon comparing results it was found that the the proper action of the machine.

The eighth floor contains the gold cells, with the redding of the groscopic re-

#### Large List of Prizes in 1914 Rubber Exhibit

THE fourth International Rubber and Allied Industries Exhibition, in conjunction with the first International Corton, Fibers and Other Tropical Products and Allied Industries Exhibition, is to be held in London from June 24th to July 9th, 1914. The object of the exhibit, like that of its predecessors, is to promote trade and commerce with all rubber-pro ducing and consuming countries, as as to bring together producers, manufac turers, chemists, sele rubber products both crude and manufac The exhibition will permit of the display of the principal commercial products of rubber grown in the soil, as well as manufactured products, machinery, and appliances. Many of the British and foreign governments and associations have already expressed their willingness to being represented in the various de-

partmente One of the most important fe the announcement is the offer of a large number of prizes to exhibitors in the dif-ferent departments. The committee of the best come sheet and assorted grades of plantation rubber; second, a gold medal for the be exhibit connected with plantation rubb grown in the middle East; third, a pris-of 460 (\$250) and a gold medal for the nost valuable improvement most valuable improvement with the collection or preparation



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# Your Funny-bone!

AN you find it? Don't try. Let George do it-George Fitch. He's an expert at it-author of "The 4:11 Train." Catch it in the September number of THE AMERICAN MAGAZINE. It will take you back to a "Homeburg" of your own, and you'll live over again that delicious moment when the world rolls into your town once a day. Most trains are "wasted," but the 4:11-well, it's a real train.

Also in September is "Lucky Baldwin," guilty of every crime in the calendar, and "Lucky" because he never wore a stripe. Can a down-and-out "come back"? Peter Clark Macfarlane says, "YES!" -and "Lucky Baldwin" bears him out. The answer is inspiring. It is the first of a series of splendidly human papers on "Those Who Have Come Back." Read it, if you know what it is to fail. Read it, if you would learn what it is to struggle against yourself-and win.

David Grayson is in the September number, and Walter Prichard Eaton; also Hugh Fullerton (at the bat), James Montgomery Flagg, Stephen Leacock and "Angel Island." And, by the way, that Train! Don't miss it-it's the 4:11-round trip, 15 cents-any news-stand-the September number of

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urther particulars regarding the ex hibits and prizes may be obtained on ap-plication to the International Bubber and Allied Trades Exhibition, Ltd., 75 Chancery Lane, London, W. C.

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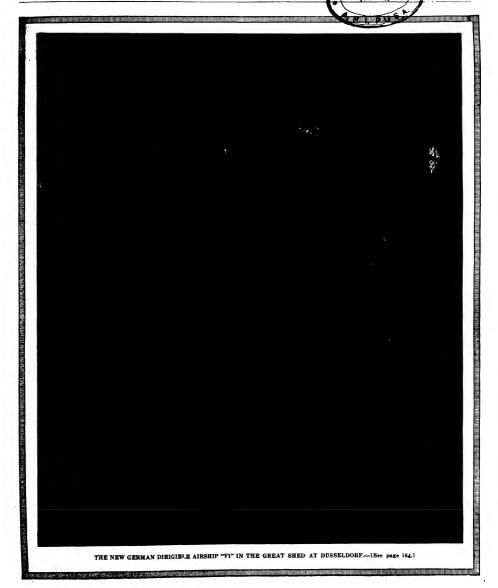
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The purpose of this journal is to record accurately, simply, and interestingly, the rewell's progress in scientific knowledge and industrial achievement.

#### A Costly Lack of Co-ordination

OW absolutely necessary it is to lay out and execute manifelial limitovements of an engl neering character upon a carefully thought out to ordinated plan is strikingly limstrated in the ease of the three great bridges which have been built during the past eighteen years across the East River, These mounmental structures, the the boro Cantilever Bridge and the Williamsburg and Man luttun Suspension Bridges. The two hist numed being the greatest structures of their kind in existence rep resent together a draught moon the city's trought of over \$72,000,000) Nevertheless, not one of them is to duy being utilized to its full capacity, and two of them day being utilized to its init capacity, and two or seem at lens). In spite of the fact that they have been com-pleted for several years, are not even vet performing their principal function as links in the rapid transit system of Greater New York - Indeed, it is only within the last few weeks that a stretch of four track subway, built to form a loop connection between two of the three es, which has bin idle for severni years, has been part in partial operation, with two of its four tracks in Furthermore, it must be several years before the Queensboro and Manhattan Bridges, representing an investment of about \$50,000,000, can be brought into full service us parts of the rapid train

Such haphward and grossly extravagint methods in the conduct of mindfull at farge is without a parallel, and the student of citic management knows not wether to be more anomalous of at the political conditions which rendered such wild extravagince possible, or at the fundant stubility of a city that could stand this tremendions study in min its recorress.

The construction of these engineering white elephants of for such they have been for a number of yours—was entered upon without my comprehensive view of the transportation problem, or my intelligent conception of their proper role as forming part of the city's thorough are the city's constitution of the city's thorough are the city's city and city are the city's city and city are city are city are city and city are city and city are city are city are city are city and city are city are city and city are city are city are city are city are city and city are city

The city is growing by leaps and bounds," said the city futhers of those days, "the present transportation facilities are landsquarte, the people in increasing numbers wish to pass from Long Island to Manhattan, the East River is an obstacle, let us build bridges." And the hidges were built

The most that can be said in extensation is that it was not understood then so clearly us it is today, that such great bridges can resultie their fail mechanics only if they form sections of the important avenues of rived. It is understood to high that trifuge terminals are a inistake serving, as they do, to promote congestion at specified points. Traffic should downcross in bridge with us much freedom as it does through any broad avenue on solid ground. The planning of great bridges should be done contemporaneously with the planning of facilities by which the various means of travel traffey, elevated, or sulvey, will be inbe to make full use of them on the very day of their objecting. Thunks to the good work done by the Public Service Commission and the Board of Apportunement, the East Bleer bridges have now been brought but their proper relation to the vast extensions of our sulveny systems which are under construction, and before many veries have passed it be probable that these grand confinering works will be rendering a service to New endsheering works will be rendering a service to New

York city proportionate to their great carrying capacity and the chormous sums spent upon their construction.

#### Wind Pressure on Ocean Liners

FEW vector ago, we offered the following problom for the consideration of the readers of the Scrievitte America. "The largest transilantle liner now under construction will present to a bend wind a cross-sectional area above water, including smokestocks, musts, etc., on hour 0,500 square feet. If the ship were steaming at a reduced speed of 15 whote against a bend wind of 66 inlies velocity, how much horse-power would be necessary to overcome the wind pressure alone?"

We offered thu problem in the conteilon that the majority of our restors in all title conception of the heavy draught in it is made a just the effectly hones power of a lace ship to meet the redshire date to while presents about a happrosolal which is coullrased by the fact that the majority and the majority and

meet in manage the extending of what redstance has both a popular and academic interest, and that it is of serious economic hapstance will be molested when we state that our lavestigation of the problem shows that in a transituate liner of the largest size, say of 100 Ferd beam, 150 Feet length, and, let us say, 60,000 horse-power, no less than 20 per cent of the horse power or ulmost 12,000, would be consumed in overcoming head-wind resistance when the ship was steaming in 15 knots, against a 65-mile gate—and we believe that this estimate is, if any-thing, rather length unmount

that correspondence with several navial authorities here and alroad despens the convertion that here is an element in the proquision of ships and particularly of the glant ships of to-day, which has useer received the actual time of to-day, which has useer received the careful investigation which its Importance demands. Thus, a beading authority on modet tank investigation writes us. "The question of the air resistance for ships has never been solved with great accuracy so far as I shaw," and our answers from avail methicets vary all the way from "compared with the water resistance, all resistances is of comparatively little importance" to the statement "in the case of ships of the size of the "importance" is much as one third of the hove-power night be consumed in overcoming air resistance in a heavy solo."

Fundamental to the problem is the question of aniressure per unit of surface over large areas such as are here considered. Some thirty years any, when its healpanin taker was destining the Peruli Bridge, he found himself saddled by the British government with a unit pressure of 50 pounds per square ford—a fact which should temper judgment with merry on the perof those critica who complain of the nuncescary weight and bulk of the structure. Our own American Society of Criti Burdineers has compromised on thirty pounds, per square foot, as a basis on which to design the windscript of the structure of the peruling of the windscript of the structure. Our own American Society of Criti Burdineers has compromised on thirty pounds per square foot, as a basis on which to design the windscript of rocks, bridges and tall buildings. One navial authority tells us that he would assume not less than authority tells us that he would assume not less than authority tells us that he would assume not less than authority tells us that he would assume not less than authority tells us that he would assume not less than authority tells us that he would assume not less than authority tells us that he would assume not less than authority tells us that he would assume not less than authority tells us that he would assume not less than authority tells us that he would assume not less than authority tells us that he would assume not less than authority tells us that he would not a series of the authority pounds.

For our present purpose, we will take 30 pointly per square fort as the mit presents, but because of the long and finely tapering low which represents 5,000 a square fort of the total projected area, we must be careful to make a proper reduction for the first fifty feet of the shift exposed above the variet line. Opinion which is not the reduction which should be made in the only four on the pounds and others would go as high only four on the pounds and others would go as high as eighteen or twenty. We will assume a pressure of to pounds per four, which gives a total endon pressure for the low of 59,000 pounds. Above the bow these same thirty feet of superstructure which presents a practically that surface against the whol, and the presure on this area of 3,000 square feet will add another 90,000 pounds to the load. To this we should add 1,500 square feet, presenting the projected area of the foremast mat the forward sanokestack; and share these present arounded surface to the which, we will reduce the unit presente to 20 pounds, which will add another, 20,000 pounds to the redstatus.

We have now exhausted the 9,000 square feet of area presented normally to the what by the total cross-section of the ship; but in a vessel 900 feet in leastly, the intervening squeets between successalve structures are so great, that we must make a further addition. We shall find that the second and third smokestacks, the mainment, the 80 or more lifeboats, the projecting deck success. The crosses, the standing sear in the way of stays, abroads, etc., will add at least another 4,000 feet.

upon which the wind implages. If we apply the reduced unit pressure of 20 pounds per square for this, another \$8,000 pounds must be added to the sale Finally, we have to consider the skin friction and making, which, if we take account of the thousand portholes, the hundreds of stanchious supporting deck the partial-vacuum effect of the square end of the wide deck structures and of the broad structure and of the broad structure and of the broad structure and the total standard and the structure and the standard standard

In summing up then, we find that there is a estal of 275,000 journals of armospheric resistance, flux be wind and the speed of ship; and a simple calculation shows that to overcome this, at a speed of 18 km/s, would require from 12,000 of 13,000 offsetive known-power, or say ulton 20 per cent of the total effective known-power, or say ulton 20 per cent of the total effective known-power of the ship.

Now here is a subject, which, if our calculations for approximately correct, any well be commended to the consideration, not morely of the builders of large schemliners, but of smaller craft of moderate dimensions, and here, but of smaller craft of moderate dimensions, and no topical boats and destroyers, which are added soon to steam at high speeds against winds of considerable strength.

#### Preventing Corrosion of Iron and Steel

As a part of its investigations relating to encious in mining, the furers of Mines has undertaken to develop a method of preventing the corrosion, by neds water from mines, of from and sixed med in mine equipment. A paper entitled, "An electrical tie method of preventing corrosion of from and select," describes experiment in councetion with an electrical time of the control of the control of the method of preventing corrosion. The results undertaken method of preventing corrosion. The results in the construction of mining equipment, as well as for the protection of structures exposed to the neith waters of stemans.

According to the electrolytic theory of corrosion, the corrosion of Iron is an electrolytic process. The Iron goes into solution no formus ions, and these ferrous ions are collision to formus ions, and these ferrous ions are collision by the conjugate of the water to fee plo, fone and precipitated as feer in the water to real. Simultaneously with the formation of the ferrous ions, hydrogen is liberated to ferrous to the liberation of the formation of ferrous ions and the liberation of hydrogen are accommunited to a transfer of electricity. The electric current flows through the neutral from the point where hydrogen is liberated to the point where from is dissolved, and through the electrolyte from the point where iron is dissolved to the point where hydrogen is liberated.

If, now, a counter electromotive force he imposed, the current may be made to flow in the opposite direction, and the solution of the from may be prevented. This fact has been made use of previously in an electropite method for the protection of holiers manual corrosion. The method consists in submerging a har of zinc in the holier water and connecting the zinc electrically with the holier plates.

In the experiments of the Bureau of Mines, carbon was used as the mode in place of zinc, and the E. M. F. required was furnished by a storage battery.

required was furnished by a storage battery.
Experiments were made on steel plates 1 inch by
2½ inches immersed in sulphurle-acid solutions. Sulfulie arrangements were provided for renewing the need
and for stirring the electrodyte. It was found that the
current density required to protect the plates depends
on the strength of the need solution, the amount of
oxygen gas present in the electrolyte, and the need concentration. The first-manned factor is probably of least
lamportance, especially in dilute solutions.

The rate of flow of electrolyte over the surface of the metal is by far the most important factor

With the lowest rate of stirring used in the experiments—35 recolutions per minute—mid in aid concentrations not greater than 1/100 normal (500 parts per million), a current density of from 0.5 to 0.8 millisusperces per square inch reduced the corroson loss to a nesligible quantity, whereas with the starter rotatling at a speed of 450 revolutions per minute and a current density of 2.0 millimperces per signare inch the corrosion loss automated to 25 per cent of the loss on the unprotected plate.

If was found that the current density required can be calculated from the loss in weight of the metal index the calculated from the loss in the calculated from the loss in weight of the metal index the given conditions when not protected and the electrochemical equivates are rent density and fs. M. F. required to prevent corrowned are given given by the prevent corrowned and the provent consistency of the prevent corrowned are given to the provent consumption per search watte, and the search consistency would be approximately 0.75 for watte, and the electric energy would be 66 kilowett bar per square foot of surface per year. These laborators best were applicanted by tests on a large scale with several account of the constant and for the prevent of the control to the control of the control



#### Engineering

THE PROPERTY OF THE PARTY OF THE

Comments of this British Navy.—The First Lord of the British Administry, reporting on the growth of the British many, resuntly stated that the navy would increase in the mest sightleen months as follows: A torpudo boost destroyer same a week for the next nine months, a lightle-sension every thirty days for the next twelve mostles, sand a super-dreadnought of the latest type overge-dward-stays layer for the next eighteen months.

Completion of Ambrose Channel, New York.—The Arrise anginees Bave reported that the deepening and arrise anginees Bave reported that the deepening and excepting of Ambrose Channel leading into New York Hambor is finished, except for a few minor details, and no 'burther appropriations for construction will be meeded. This great artificial channel is 7 miles lung, 2,000 beet wide and 40 feet deep at mean low tide Ar higher it no be leithlantly lighted by buoys that the largest occass securiers can enter with perfect safety. The work weakepun in 1901.

The New Gladstone Dock at Liverpoot.—The fines Gladstone Dock at Liverpool is 1,020 feet long. 129 feet wide at the entrance, and carries a depth of waker over the sills of 40 feet at high water of ordinary againg tides. This dook is the first installment of a scheme is avolving the exponditure of \$15,000,000 The purposed work includes also an entrance lock over \$70 feet in length and 130 feet in width, and in the madde dook area there is to be a half-tide dook of \$154, acres, two branch dooks each 400 feet wide, with a pier between them over 1,300 feet in length.

A Past in Stone Cattling.—Our contemporary Engineer confine attention to an interesting work of stone certifing commercial with the laying of underground trolleys recently the solid stone Bont Neuf, Paris. It was necessary to cut through the solid stone massonry two trunclets, 4 feet wide and 6 feet deep. This would be an intereminable task fit twee cut by massons in the ordinary way. The work is boung done by an electric motor connected to a drum, from which endless cutting were are carried overhead and around sheaves placed in pits which have been sunk to the depth of the trench to be our

Battle Efficiency of the United States Navy.—Tho shall standing in lattle efficiency of the U. S. Navy shall in the battleship class the "Idaho" is in the lead, while in the totroped class the list is headed by the distroyer "Whippie." Out of a possible 100 points for gather, scored 100 points for gunner, and \$78 for engineering, the final ment mark being \$94.5 This ship is in command of Capt W. I. Howard. In the torpido class, the distroyer "Whippie" stands first, with \$97 for gunnery, \$15 for ongenering, and a final ment mark of \$5.9. Her commanding officer is Lieut. M. K. Matterill.

Tracks Should be Scientifically Designed.—In an admirable paper road by E. B. Milure before a technical security, the writer draws attention to the need for a scientific invastigation of the atrease to which the road-loid of a rulway is subjected. But quotes from an investigation made by O. E. Solly, in which that authority found that after careful consideration of rul-loading, the behaving, depth of ballist, e.e., the structure for a loading of 60,000 pounds per ade should be Thea 7 inches deep, 9 undes wede and \$\frac{1}{2}\$ feet, for single track, ballist, 12 inches of sono and 12 inches of gravel. The rail should be 7 inches high with a 6-inch, base.

The Lostachberg Tunnel In Operation.—The new Lostachberg Tunnel Route through the Alps which was offensily opened on June 20th, is now in operation. The distance from Milian to Paris via the Mont Cenis unture is 560 milies; through the 8th other Albert of the Standard through the Simplon-Lootscherg and Neuerlack it is 513 miles, and through the Simplon-Lootscherg and Neuerlack it is 513 miles. The new line is 43.47 miles in length. The tonnel itself is 9.07 miles long, and it cost about ten million dollars. The line is electrically operated by locomotives of 3.000 horse-power weighing 112 tons, and an overhead system using a current of 15,000 volts employed. The locomotives of 14.0-ton trum up the maximum grade 2.7 per cent at the rate of 30 miles as hour.

Night Mortar Piring.—It is the opinion of the officers that virtuessed the recent night target practice at Fort Hancock, New Jersey, with 12-linch mortars, that if the vessels of any foreign fleet attempted to enter the harbor by night they would be destroyed by the plunging fire from the mortar batteries. The practice was done at a target 12 feet square, which was towed by a tug. The first three and fifth shots hit within a 50-yard radius of the target; the fourth fell a triffe short, and the other five somewhat overshot the mark. Capt. H. S. Kerrick, attached to Fort Hamilton, said that the practice showed the mortars to be the best defense for coast fordination, since mortar firing was now so advanced as to be fully as accurate as that of the heavy, direct-first current.

#### Electricity

Push-button Gas Lighting.—An electric gas valve has recently been invented in Parts which works with direct pressure on a gas outlet. It may not be generally known that only a slight pressure is needed to hold a valve down against the pressure of tho gas. The device constant of a very small flat metal chamber scoresed in between the fixture and the burner, and the gas onters the between the fixture and the burner, alghting as effected high citing gas into a small tube adjacent to the mantle wheth centains a platinum spiral traversed by the current to bring it to reduces, then it is raused to white best by eatlayte action of the gas, producing a fiano to light the mantle. Lighting follows instantly on pressure a button mantle.

Electric Line for Constantinopin—The project for running a metropolitan electric line for Constantinopia is well under way according to recent reports, and the scheme includes the formation of what is known as the Ottoman Metropolitan (Company, capitalized at \$5,000, 000 for the purpose of building and operating the line. The concession for the enterprise has now been awarded to the Deutsche Bank who were the original promoters. From the starting point at Stamboul the line crosses the foliage life and reaches Pancadid and Shahif, running throughout the course in double track. Work is to be finished as far as Pancadid in 123, years from Ottober 1st, 1912, according to the terms of the contract, and the rest will follow within a 10-year period. A new bridge over the Ottober 1st, and the rest also several but the company for a branch line going from Routh to Dolma-Baghteheb, also a line from Stanboul to Venkapin.

Electrifying Paris Suburban Railroads.—M. Mazen, a prominent railroad official, gives some interesting in-furnation on the scheme for applying electric traction on the western suburban railroads in the region of Paris The magnitude of the project will be seen from his state ment that the railroads entering the three depots of St re. Montparnasse and Invalides have rolling stock ounting to 1,500 cars and 200 locomotive likely that the direct current electric system at 650 volts will be adopted, and this will mean the use of about 500 motor cars, together with trailers Sub-stations along the railroad line will furnish current to the third rail, and will receive their supply from three-phase 15,000-volt hines coming from the central stations. That the work is in progress will be noted from the fact that the con tracts for two large power plants have already been awarded. These stations will be located at Moulineaux and Bezons, upon the Seine, and when completed they and pooning upon the term, and won complete they are to furnish upward of 100,000 horse-power, using steam turbine groups of 7,000 horse-power size. At a future date it is likely that the Rhone and Geneva will be called upon to furnish a large amount of current for Paris over a power line, and on the other hand there is a likelihood a power line, and on the other hand there is a likelihood that the Lens coal lunes in the north of France will also be called upon, using a 100-inite power line. A type of third rail will be used having collecting shoes rubbing over, being mounted upon blocks of treated wood. The sub-stations will have from 1,000 to 2,000 horse-power rotary-converter sets which need no transformer, but will give a direct change of high-tension alternating cur reut into continuous current at low voltage,

The St. Denis Steam-turbine Plant, -In view of the derable additions which th e great St Doms ste turbine plant has received of late, it will be timely to turnine plant has received of late, it will be timely to give a rezumé showing the leading features of the station as at present installed. It will be remembered that the plant lies not far from Paris and is one of the sources of the city supply both for light and traction, including the extensive subway system. At present the station has five Brown-Boveri steam-turbine alternators of 4,000 kilowatts, four groups of 6,000 and one large one re-cently installed of 15,000-kilowatt (20,000 horse-power) capacity. These turbines work at 750 revolutions per minute and the alternators deliver 10,250 volts. groups serve to produce three-phase current, and the plant has also four 6.000-kilowatt groups used for twose current supply and running at 835 revolutions per Two other turbine alternator sets are designed to produce either two-phase or three-phase current and use one turbue mounted with two different alternators the same shaft Condensation for the ton gr taken care of by ten surface condensers in the br ment, each one using an air pump driven by a direct-cur-rent 50 horse-power motor, while the large 15,000 kilo-watt group has a condenser provided with a 60 horsemotor for the air pump and a 250 horse-power ation water pump There are also four "polymoreirculation water pump There are also four "polymorphie" dynamo groups, each one composed of two alternators (two-phase and three-phase) coupled to two 550 voil direct-current dynamos. Any of the machines can serve as a motor for driving the rest so as to have various suppless of current. For the direct current, the plant uses a small turbine set and also two large motor-genera-tors of 1,200 kilowatt size and two of 600 kilowatts, work-

#### Science

Moving Pictures in Greek Schools.—A consular report states that the Minister of Education at Athens has opened negotiations for an early matablation of no fewer than 4,000 natural color moving-picture machines, with supplies of films, for use in the State schools

A New Method of Determining the Dev-point is described by Higgounderfi in the Physicalizethe Zatischriff as follows: Take n vessel of some metal that is a good conductor of back, n g, n silver on copper one. Pill it with water, and introduce the bulb of n thermometer. Then add slowly some sait, such as sal ammoniae or hyposulphite of soda, the solution of which lowers the emperature of the mixture, meanwhile strange the liquid with the thermometer. At the precise moment when the until of the production of the development of the strange casted with mosture note the temperature of the strange of the strange of the development of the strangending of the development of the strangending of the strangen

Radium Emanation Therapy was discussed by Dr Saubermann, of Berlin, in a recent before the Bongen Scoreju in London. As reported in the London Times, the becturer stated that in the whole range of discusses of metabolism, mediading goat; remarkable or multiple and a second control of the remarkable of results had been obtained by the use of water artificially charged with radium emanation to a much higher degree than the water found in any natural spring. As to the claims put forth all over the continent by various spass, he said that in the majority of cases the amount of radium emanation in the water or the air was too small to have any physiological effect.

Alt Carrents at a Height of FHy Miles above the scart are discussed by J Islamin Clark in the Quantity Journal of the Royal Networkopeal Sweety, on the base of observations undea timan places in southern England and northern France of the drill of a particularly length and persistent meteor train seen on the inglit of February 22nd, 1909. Mr. Clark lumself size the train for 10 minutes. The most remarkable conclusions drawn by the writer relate to the velocits of the upper winds at Aurious levels, as indicated by the movement of the train. Thus it appears that between  $190_2$  and 51 mHz sultrain the strenk lay in west vanied of ever 170 mHz in hour, while at 511  $\gamma$  mHz with the current was almost from the each with a velocity approaching 200 mHz as a hour. Those conclusions hardly agree with the prevailing conception of the stracklay ever as a region of gentle winds.

Hall Insurance in Great Britain is fairly general in Half Insurance in Great Britain is fairly general in only two counties, viz., Bedfordship and Huntingdon-shire, where its providence is explained especially by the fact that these counties were visited by a very destructive harlstorm in August, 1906. The two counties just mentioned and parts of Cambaidgeshire and Northamptonshire are subject to rather frequent hadstorms, but over the greater part of the British Isles loss from had is so small as to be almost negligible from the standpoint of the underwriter. The British Board of Agriculture which has been collecting information concerning had insurance as enried on by British companies, has received prospectuses from six of these concerns, five of them charge a uniform promium per acre for the whole country, while the sixth follows the more equitable plan of varying the premiums according to the meteorological history of each section, i.e., the number of damaging hallstorms that have occurred within a ten-year period The results of the Board's inquiries, together with a chart prepared by the Meteorological Office showing the num-ber of days had has been reported during July and August at different places in the United Kingdom ten years 1903-1912, are published in the Journal of the Board of Agriculture for March, 1913

Recovery of Metals From Smelter Gases -- By means of Cottrell's method of electric precipitation appreciable amounts of precious metals have been recovered from smelter shine gases, which have been heretofore con-adered as waste products. At a prominent New Jersey copper smelting works a plant to treat gases arising from elting slimes is already about completed and several smelting companies are preparing to install converters. The copper as recovered from the ore and as received at the electrolytic refinery, usually contains a conand raise amount of silver, gold and other precions modals. During the electrolytic process most of these elements settle out from the electrolytic. This sediment or mixture, colled sline, is then treated in another department for the recovery of the presums metals This is usually done by drying the shine and driving This is usually done by drying the shine and drying off the volathe elements by means of a furnice treat-ment. Some of the silver is volatilized and even small quantities of gold. The heavier metals condense in the flue according to their relative weights Gold is found to the flue dust near the exit from the furnace while silver, being lighter, is carried further along wine siver, being lighter, is current terriner among At points further removed are found antimony, arssine, selentian and other elements. The presence of zinc, arssuic and antimony seems to have an appreciable effect on the deposit of silver and samples of dust from such refineres have shown the amount of silver to range from 100 to nearly 2,000 ounces per ton.

#### Cooling Gas Engines in a New Way

I N most gas construes, host be removed by circulating and the exhaust valve. About thirty per cent of the heating value of the fuel thus passes into the metal of the engine. Beadles, external water cooling is the cause of many disadvantages under which the gas engine labors and which that its star. There are also secondary effects. In order, for example, that the heat may then from the fune surface of the metal, where it enters, to the unter surface, where it is been except the most officer of the metal, where it enters, to the unter surface, where it is been except that the surface most function of the metal where the enters of the metal surface, where it is been except that the third of the enters of the metal surface is the enters of the enters

To overcome those difficulties Prof. Bertrum Hopkinson of the University of Cumbridge proposed, in a paper recently read before the Institution of Mechanical Engineers, to apply the cooling medium inside instead of outside the eithider.

The idea of introducing water into an internal combustlon engine is not new, as Prof Hopkinson admits. but it has never been effectively carried out because the conditions which must be satisfied if the injected water is to act as an effective cooling agent have no realized. Of these conditions the most important Is that the water must be projected in comparatively course drops or jets, directly against the surfaces to be cooled, so that it reaches these surfaces in figuid form without much loss by evaporation. Furthermore, it must be distributed properly, so that each portion of the metal receives water in the proportion in which If the water be turned into stemu It receives hent before reaching the metal, it would exert fittle if any cooling effect. If the water is not properly distributed, those portions of the cylinder walls and piston which do not receive an adequate supply must be conduction to the properly cooled portion the heat which they receive, and, in consequence of the hespalities of temperature thus set up, an important advantage of Prof. Hopkinson's method of cooling (substantially nulform (emperature) is lost

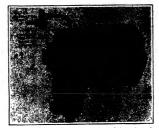
While the spans have in the past proved useful for the prevention of predigition and for the softening of the explosion, they are not effective for cooling. Prof. in Hopkinson's method of lateral injection is clearly revealed in the numeral illustration. Cold water is to jected through a hollow consting which projects into the disperted through a hollow consting which projects into the oncombostion chamber and while its proceded with a numter of holes or small nozice alone 1/22 of an inch in diameter. The Jets thus, formed are comparatively course. Even whom projected into the finance, the water performs lits function with but little evaporation on the way. The Jets are directed to all parts of the sorface of the combostion chamber and against the face of the below.

But what about curro-don? By the shuple device of regulating the amount of water injected in such a way that the temperature of the whole engine is maintained well above 100 deg Cent, this apparently insuperable difficult has been coverous. Every drop of injected water is builed when it renches the walls, and no liquid can accumulate to form sulphure acid with the sulphur dioxide contribed in most producer-gas. What little gas the large drops of water abose h is at once driven off when they strike the hot metal, because the water is almost instantly converted thou steam.

It be sufficient to toject water on to the surface of the combustion channels and the head of the poston only, the whole of the coding of the harrel being effected by conduction into the ploton which is best kept cod by the projection of water cuto the head when it is men the in-center. This, of course, be the opposite of what occurs to a juckeded courie, in which the heat those from the piston into the jacketed barrel. By taking advantage of this fact, the application of water is confined to places where it can do no harm, nous fulling out the shifting surfaces. This is a point of some importance if the water contains much dissalved and

In his paper Prof. Hopkinson gives an account of some toets made with a 50 horse-power Crossive engine, raried at 40 brake forse-power, 11% inches the diameter by 21 horles stroke, having a speed of 190 revolutions per minute. Out) the external water-cooling system was removed. The oughts was run continuously far 22 hours on no electrical band with cost gas 11 developed during this period 43 brake horse power out the average, and the average mean effective pressure was 101 pounds jet square lack. When lacket dotted the engine would not develop amore than 49 brake horse power confinemently without corrhesting, and mixtures giving a mean pressure of more than 100

pounds per square inch produced excessive maximum. pressures (over 500 pounds) with violent thumping explosions. Water injection reduced the assumum pressure by over 100 pounds per square inch and made the explosions almost insudible. The formation of the steam involved practically no thermodynamic loss. The



Prof. Hopkinson's method of internal injection of water to cool gas engines.

quantity of water used averaged 102 pounds per hour. The temperature of the engine varied from 150 dec, to 180 dec, feel No water was visible on the platon or the spindless of the vaives. When the engine was picketed und gave the same power for short periods, the Jacket water removed about 67,000 British thermal units per hour, which would be sufficient to evaporate 108 pounds of water at a temperature of 20 deg. Centmoder atmospheric pressure. Watereve difference there may fave been between available heat and amount of water value and the superature of 20 deg. Centmay fave been between available heat and amount of water evaporated is accounted for partly by greater radiation loss, and partly by the reduction in fiame temperature produced by the steady.

perature produced by the steam.

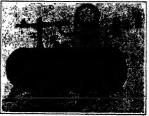
The engthe consumed 15 feel of coal gas per brake horse-power hour reckoned at almosphoric temperature and pressure. This is approximately the same as it burst when developing the same power for short periods when jackets.

When coupled with a dynamo in a factory engine room, with an increase in speed from 180 to 105 rerointions per minute, the engine developed for several weeks in times 50 mike horse-power with coal gas for several hours together—an increase of 25 per cent on the maximum continuous load which it could safety carry when Jacketed. Since then the engine has been in regular service for two years with an antiractic suction producer. A syst there has been no trace of corroston in the engine, although some corrosion has been observed at the heads of the exhaust pipes where the guess implage on the metal. This corrosion can be avoided by engine that are removed the artists.

a volded by suitably arranging the pipe. From the nature of this method of coulting, it would seem attract or that method of coulting, it would be income at the country of the size of the engine. The method has been applied to an engine of 18½ inches hore, giving 1036 bines power Oechel hanner engine of 30 inches hore. The trials of this larger engine proved beyond any question that the largest cylinders now built can be couled entirely by water highest on and that the quantity of water used—about 24 pounds per brake horse-power hour—seems admost hiderendent of the size of the engine.

#### A Stationary Chemical Engine

THE value of carbonic acid gas as a fire extinguishing agent has long leven recognized Statistics show that from hirty to eighty per cent of all fires (in the different cities where the figures were gathered) are extinguished by chemical curines. These fagures, or course, relate to those entires which are portable either by hand or on wheels. The latest type of chemical endine is a large stationary outfit intended for use in



he new chemical engine with section of cylindcut away to show working parts.

office buildings, private lowers and buildings, private lowers and buildings of the signal signature was installed as a New You last week and demonstrated for representations of the signal several insurance see and city officials. The accompanying illustration clears:

The accompanying illustration constraints working parts of the english. The steel was very contrainted to the english. The steel was throughout with lead and is teered to english a surported below its center on an english steel in the I. is supported below its center on an english steel in the steel in

At the top the tank is connected with a characteristic pipe D which may be coupled with any namine of with may permit the heads A, in the hand value B with home A, distributed throughout the building. From the characteristic hand with the cylinder B projects a small pipe which assume in a small gold plate G, through which a subsule with a driven. At the top of the tank is a handsale consideration of the connection of the control of the connection of the connection of the connection of the connection for carrying a safety value B and an overslow value B.

To charge the outline the piston rool is moved a blood to the left, allowing the frame K with the besides Leib is removed through the handbole. With the considerable to the removed through the handbole. With the considerable valve. This allows a certain quantity of vator to he placed in the tank each time it is filled. For a tank holding 100 gallons of water shout fifty pounds with the product of the considerable with the pounds with the pounds of the considerable with about sixteen pounds of sulphurds acid, after which the cap J is replaced and firmly screwed down.

It will now be seen that the air space in the english and that in the julpe system are separated by the water line which fills the cylinder K nearly to the top, and by the small good displayang d perforated with a milante hole. There is, therefore, no communication between the two bodies of air except through the cylinder, which is normally shut of by the pitton, and the displaying d. By means of any suitable air pump the air is compressed in the pipe line to about ten pounds pressure. This is accomplished by attaching the jump to the lift by the lift of the fault through the small displaying d, and when pumping ceases the pressure is equal in the tank and the pipe line.

line may be in fire, the heart of which automatically opens one of the sprinkler heads, or in case a hardwise is opened, the present is lowered in the pipe-line at a much finite rate than in the tank, as a result of which a pressure is induced against the photon in the vibility of the pipe-line at a much finite rate than in the stark, as a result of which a pressure is induced against the photon in the vibility of the pipe line. The subject is immediately uplied into the sold solution and the resultant each of the solution of 125 to 150 pounds per square inch. This forces the water up through the pipe H. through the or the pipe H. through the order of 125 to 150 pounds per square inch. This forces the water up through the pipe H. through the vibility for a first in case of far. The busser may also be likely to fail in case of far. The busser may also be set to sound a large gong O if the pressure should redset to sound a large gong O if the pressure should redset to sound a large gong O if the pressure should redset to sound a large gong O if the pressure should redset to sound a large gong O if the pressure should redset to sound a large gong O if the pressure should red-

be connected with a requiar fire alarm system.

In the demonstration mentioned the tank was placed
on the top hoor of a six-story building and connected
with a system of aprinkler heeds and hand valves, in
the basement. From the time the water was turned
on at one of these laqued valves until it reached the outtie of the hose, a period of only six seconds elapsed.

#### The Area of Canada

I N an article on mapping the world, published in the Schusturic Aurancan of Joly 20th, we stated that the distortion produced by the Mercator projection gives one "the notion that Chanda is twice the size of Canada is less than that of the United States." As a matter of fact the area of Canada is less than that of the United States. "When who when the state of Canada is less than that of the United States. "When the state of Canada is less than that of the United States. Canada is a 3,729,805 square miles as against 3,009,739 of confinential United States stylicot Alaska.

An Interurban Airabia idate.—It is stated that passage ger airabip service is to be astablished in Raginard by: a company which will be expitabled at \$1.250 CM. The sixthips are to fravel from Lordon to Religibles, Main charter, Birmingham, and Parke, some other phone.

2.1

# Pedagogical Laboratories

Children are Studied in a Russian Laboratory from Their Birth Until Their Twenty-first Year

By Dr. P. R. Radosavljevich, New York University

L'Espaido importe cell deny that an L'Espaido importe de principologico de l'Espaido importe de l'America de l'

reseats basis we need: (1) Peda-regical schoratorics, which ought to be the real sancts of all true educators would know the pedagogical truth understand the real workings of normal mind of school children and the nature and the postulates of school educational reforms; (2) Pedagogical elimins, the function of which should be to ever and cause to be remedied, as far wibie, physical defects and comsicable diseases that might interfere with efficient school work of pupils; (8) Experimental schools, the purpose of which is (\*) to find out by experiment schether, how, and schere the school educational ems may be worked out, and (b) to save time, money, and energy of other people in performing similar elaborate experiments which, of course, require most favorable conditions, especially unhamp ered work with all the needed resour at hand, in order that results may be reached, both freely and securely, and not by mere subjective discussion and one ed theoriging

We have no real, scientific experimental we hoole and pedagogical ciluies. The few attempts made in this direction were quast-scientific undertakings of private individuals (Dewey, Rieddie, Lietz, Fey, Tolstoy, Yenzel, Ferrero, Montessori, etc.), who were willing to reform the present who were willing to reform the present school education, but had no incessary means for such a bit tank. We have only a few pedagogical periodicals, series of monographs, associations, societies, clubs, congresses, institutes and academic lectures. Germany leads in this field. She has about thirty scientific pedagogical periodicals dealing with the problems of experimental pedagogy, about ten different series of scientific pedagogical pediadogical medical pedagogy, about ten different series of scientific pedagogical metals of experimental pedagogy, about ten different series of scientific pedagogical metals of scientific pedagogical metals of scientific pedagogical metals of scientific pedagogical monographs, acceptance of scientific pedagogical metals of sci



A corner in the Zürich laboratory abowing models used in teaching anatomy and physiology of child's central and sensory nervous system.



Apparatus of Zürich isboratory for studying pupil's association and reaction.

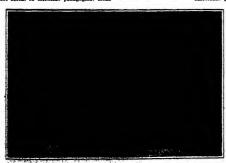


Apparatus of Zürich laboratory for studying pupil's memory, perception, emetional phenomena, etc.

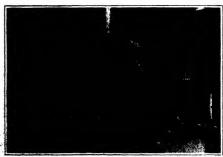
graphs, about 30 associations for the study of school children, etc. Next 16 Germany comes. Swiftzerland, then Beiglum, Holland, France, Russla, Italy, Sweden, Austro-Hungary. The majority of Germans and other European and American psycludegical Inditutions are more or less engaged in some pedagogical investigations with special reference to the psychological bads of 11.

The first inhoratory which devoted its energy to real pedagogical experiments is Meumann's Laboratory in Zarich Men-munn's residence in Zürich (1807 to 1905) signified the birth of experimenlin laboratory tal pedagogy. His laboratory soon be-came the main station of scientific pellagogical research, a Mecca for many foreign students who wanted to get pedagosleni facts and were willing to labor in order to observe the real educational conditions. Later he founded similar laboutories in Konlgsberg (1996), Münster (1907). Halle (1909) and Lelozig (1910) In Unmburg he has his latest laboratory, and in that city he is organizing the first International Institute for the Study of School Children - It is a hopeful dux for education that a man like Prof. Memanan, buoself a master in experi mental psychology and philosophy, turned to the practical problems of pupil's de velopment and school instruction combines in a very luppy and musual was the different analifications of a good observer of children and pupils. He has the very first conditions for success (1) a loving interest and the clem sympu-thetic hesight which grows out of this, and (2) he never allows his sentiment to get the better of him, looking at the child from an importful and publised technique cal point of view His laboratories were, therefore, always filled with caracst stu His laboratories were, dents of all nationalities (Messmer, Ebert Mugneff, Zoneff, Smith, Pentschew, Winteler, Ziegler, Engelsperger, Abrancoff, Mayer, Schmilt, Pfelffer, Eckhatelt, Kar-Alblon, Goddard, Starbuck, rust, Borst-Durr, Keichner, renberg. Hoesch Ernst, Borst-Durr. Segal, Gineff, Rakitsch, Chubrovich, etc.), and his lectures were attended by as many as one thousand students

Memanias Informaties and Institutes (1) collect anthropometric and psychophysical data for the purpose of establishing norms and for necertaining such relationships as may be of service to school editention. (2) apply precise psychological apparatus and thartmanets, and accurate scientific methods to scientific school editentional problems, particularly methods of hydror teaching and comony and technique of learning, (3) examine school editerior fellenting, (3) examine school editerior follenting, (3) examine school editerior fellenting, (3) examine



Augustatus al Mirich Liberatus for sindying arm-matements in Militari.



Apparatus of Effrich laboratory for studying child's reading and visual

educational management, and (4) give practical and theoretical instruction in experimental ped Pedagogleni investigations are carried out also in

mnoy psychological laboratories and institutes.

Another type of pedagogical laboratory is remarkable and is the first of its klud in the world. It is the Psycho-Pedalogical Institute in St. Petersburg. This Psychological Institute in St. Petersurg, This institute was founded in 1006, by the generous gift of a great Russian judianthropist (V. T. Simin), who gave to the institute in beautiful "internat for the Study of Mini as a Subject of Education," and also 52,000 rubles. The director of this institution is the fumous Russian biologist, V. M. Bechtereff, president of the Psycho-Neurological Institute topened on February 1908), founder of the first Criminological of Russia (St. Petersburg, 1908), and one of the greatst scientists in Russia. The plan of the psycho gical institution is to provide for 10 to 15 beds to study the mentulity of buman beings as subjects of educa-tion. Each subject is studied and educated from birth up to 21 years of uge. The first child who entered this institute was a baby boy, named Seryoja Parlnkin, who is noder constant care and observation of two physicians (Drs. K E Lityshelden and T P Spirtoff), and three unrses

The programme of the studies of these babies is too long to present here. We may mention, however, that it includes not only the problems of the present, but also those of the past of the child, i. e., his hereditary traits and his preparal life. Here they study carefully the child's organism with all its function, and the dependence of the organs upon environment. The child's temperature is noted every day as well as its pulse its breathing, and its nourishment. From time to time the child's weight, tody proportions, leelhing and various discomforts (injuries, sickness, etc.) are recorded The whole development of the sense organ is studied. All these observations will give the mos precious practical conclusions in regard to the first days of a child's psycho-physical life, the first steps of his bodily growth, which is closely connected with the in addition to that a series of interesting scientific and practical questions are studied viz, habit formation in children, antural (native) and artificial (due to exercise only) movements, the child's relation to conscious and unconscious objects, his relation to his new acquaintances and friends, his fears,

Such un objective, patient and constant individual study will be of immense value to pedagogy, physiology and psychology of the child. The 81 Petersburg instituiion should be a great aid toward making good pupils and good teachers. Logically, it does seem that we m know by experiment, before we can teach, or before we can show others how to leach school children. Curi onsty enough, we have thousands of normal schools but are just beginning to talk about the need of the kind of school that should precede the normal school Sittl we ought to be content that the old school method. founded upon a rigid faith in the book and traditions processes, is loosing its ground almost duity.

#### The Other Side of War

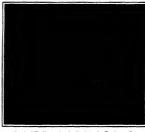
RY this caption Dr E Helme, writing in Le Temps, means to indicate the rougher side with which the individuals come into painful contact who feel within their own skins the effects of modern weapons their own same the question Will war be more muruerous the question will war be more muruerous that capt answers with an unhestathing affirmative. Wars, it is true, instead of hasting a hungrian towars, as in bygone days, now hast only a few months. But this, he says, simply means that the blows are heavier, and the combatants are sooner exhausted. The Russo-Japanese war lasted ouly eighteen months but the battle of Shu Ho, in Mancharia, justed tweive days. Thus, although the number of killed and wounded per day in the actual fighting of the Franco-German war not have been greater, the losses in buttle in the Manchurlan camonize were much greater to the aggregate. The truly terrible fact, however, is the increasing proportion of mortal to non-mortal wounds. In the Franco-German war of 1870-71, the victorious army lost ten men killed to every 58 wounded. In 1904-05 there were ten Japse killed to every 37 wounded.

Coming to the explanation of these facts, Dr. Helme dismisses as "o troublesome legend" the story that ern bullets, being smaller and moving more rapidly, inflict less serious wounds Really slight wounds, he heal more quickly and more thoroughly maintains nowadays than formerly; but the severe wounds are no less severe and much more frequent. To litustrate this the writer considers, first, the form and structure lins the writer considers, first, the form and structure of projectities and then their motions. The lance coeff handled inflicts severe abdombial wounds," and the Japanese cut-and-thrust bayonet "ly terrible," but the writer's main theme is the effect of projectiles

First comes the rifle builet, "but yesterday the Que forderess of Battles." The German builet consists a core of lead hardened with antimony, covered with

a steel jacket. It is none the less efficacious because s off and acts on its own account the jacket often com as a lagged fragment of metal, lacerating the human body. The French bullet, though not jacketed, is not kinder to the enemy. It is longer and sharper-pointed than the German, and is made of a mixture of copper and sine. Becoming bent by ricochetting, it someti and zinc. Becoming bent by riconerting, it sometimes enters its victim's body in the shape of a hook; some-times it "tumbles" in its flight, enters broadside-on, and makes a long, gaping wound. Up to a range of 800 meters these rival horrors are one as bad as the

The gravity of the wounds depends on a multitude of conditions. On the rocks of San Juan, where the bul-iets ricochetted in wonderful fashion, the American cons reported frightful injuries. It was the same

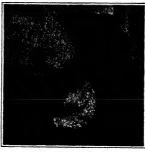


Prof. Wladimir Michailovich de Bechtereff

He was born in 1857 in Wiatka (Russia) and is on he greatest living Russian scientists, whose works are shed in Russian, German, French, and Bohemian

at Spion Kop, in the Trausvaul. It used to be said. optimistically, that a bullet heated by friction in the barrel of like rifle would reach its object asepticized by friction; but this hope has been dispelled by the re-searches of von Koler, showing that the temperature of the projectile never comes within many degrees of that is necessary for the destruction of micro The crueity of the modern bullet has been anginented, too, with the increase of its rotation, so that it acts not only as a club, striking a heavy blow, and a perforating point, but also us a gimlet which lacerales the

But bullets, after all, are mild agents of destruction when compared with up-to-date shells. The shell wounds in the war of 1870 were only 91 per thousand; ilie Manchurian campaign th sand; in the Balkan war of 1912 they were four times



Some anthropological instruments which are used in a pedagogical laboratory.

as numerous as in 1870. The shrapnel shell has the advantage (to its employer) of scattering destruction by means of some hundreds of small round bullets as well as the fragments of the shell itself. This "devil's watering-pot," as the Russian soldiers called it works within a radius of 10 to 30 meters; at 100 meters its "dewdrops" are still lively enough to penetrate 6 centimeters of pine board; at 200 meters a turban will protect the head from their effects. The tortnone incisions made by shrappiel are particularly difficult to disinfect. But in spite of all this, and though the ear of the most harder ned veteran is said never to become accusement to the destin-song of shrappel overhead, the common shell is resily more terrible. Its frag-ments, brought to a very high temperature by the ex-plosion, "burn the flesh so as to sompel crise of agony which only morphine can swiet.". shells of the naval guns "not only or asphyxiate, amputate portions of the

Dr. Helme's study of the moves and its effects at various ranges, a sues, should be minutely intere the pomp and circum effects on bones, in particular, are explosive; (2) comminutive; (3) co explosive; (2) comp iting when the range is not gree splinters the bone so thoroughly as quent accusations of using explosive become a feature of modern war no proper to the sone of from 500 to 1, tinguished by the danger of brings ments of soiled clothing, carrying effects are observed only in the main in the spongy extremities there is except when the extravasation of bla d condition of the joint.

The effects of projectiles on soft the ning liquids has led students of some highly interesting experiments. an empty metal vessel makes a small hole to and leaving. But a bullet fired at the vessel filled with water, while it enters the centimeters wide. This very fairly ille cts of a bullet upon, say, a human ste explanation advanced by the experimenter is: ssage, the bullet carries with it molecule of very small mass, but move with great rea being projected in all directions, have & of compressing the lucrt molecules (of the sa medium) and an outburst of the wail of the variefollows at the excess of the projectile." And so it is iliai bullei wounds in the stomach, biadder, the that pullet wounds in the womach, plander, were testines and head, received at short range, profile veritable explosions of these parts.

The writer concludes his discussion with the con-

solution, such as it is, that science and humanity appear in a much better light when we consider that achievements for the benefit of the good men who are

#### A New Wright Hydro-aeroplane

A NEW type of Wright hydro-aeropiane has been de-signed by Wilbur Wright. In the tests which have conducted on the Miami River, near Dayton, O. Mr. Wright has already made more than a hundred successful flights. This new machine, which is known as the Wright Model CH, is remarkable for the ease with which it starts and alighia. The planes, rudder, motor and drive follow the standard Model C lines. The span is 38 feet, chord 6 feet and the surface area about 440 square feet. The weight empty is 1,160 pounds, including the main float, which alon The hydroplane unit consists of a single 240 pounds The hydroplane unit consists of a single fout 6 feet wide, 10 feet ong and 10 inches deep, be-slides a small pontoon which supports the tail. The machine is equipped with a new Wright siz-cylinder, 00 horse-power motor, which drives two Nig-foot propellers

#### One Starter in the English Coast Flight

THE London Daily Mail's \$25,000 contest for the circuit of the British coast with an all British hydro-aeroplane, was started on August 16th from Southampton with phly one participant, Harry G. Hawker, the winner of the Michellu prize in 1912. Hawker carried a passenger, and made his first landing at Ramsgate, a distance of 144 miles from the starting point, which was covered in 143 minutes. His machine is a hiphane equipped with a 100 horse-power motor and with a tractor propeller. The only other entrant remaining on the list of contestants is Frank McCle who did not reach the starting point in time to begin the flight with Hawker, but who was expected to en the contest later in the week.

#### The Retirement of Commissioner Moore

DWARD B. MOORE, retired from the Patent Office u August 15th, after a service as assistant ou missioner and commissioner extending over twelve years, and following service on the examining corp of alout eighten years. Mr. Moore has embered upon the practice of patent law, becoming a member of the firm of Moore & Clark with offices in Washington, D. C., and New York city.

#### Cleaning Boiler Gages

Cleaning Boller Gages

A GOOD way to clean the deposits or stains from
A the giase gages on steam bollers is to remove and
soak them in the following solution: Water, six ounces;
sait I ounce acetic seid, I ounce. After the giase is
thoroughly moistened place some baking sods inside
and place back in the solution. Agas is servived disk;
removes the iron or calcium stains in the tribe. The
solution is harmines to the hands. A cloth draws,
through the tube drives it and cisaness remaining spate. 4-1-150

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#### Correspondence

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editors are not responsible for statements the the correspondence column. Anonymous comsistence connot be considered, but the names of presidents will be withheld when so desired.]

#### Acknowledgment of Indebtednes

Treets Editor of the Scientific American:

Separate saws of Pobracy with those appeared under

Separate saws of Pobracy with those appeared under

Separate saws an article entitled "Shall We Build Battle
Separate saws and particularly within

Separat

The arguments therein advanced are in no sense and the manner of the same than the manner of the same them I am indebted to former Naval California R. H. M. Robinson.

be glad if you would pushish this letter in R. D. Gatewood, Navel Constructor, U. S. Navy,

Fleet Naval Constructor United States Atlantic Fleet,
U. S. S. Wyoming, Flagship.

A Judicial Decision Involving the Camera Film

A DECISION was recently hauded down by Judge Hasse of the United States District Court for the Western District of New York, in the case of the Goodwin Film and Camera Company vs. the Eastman Koffak Company, a decision, which, if sustained on appeal, will be of far-reseating effect.

Roth-holders for films were suggested at a compararelyst party period. Their use, however, was restricted. There was a demand for a fischile and rollable film support which could be conveniently carried by the photographer in piace of glass. In 1985 such a film was derised and made practicable by Mr. George Eastman. This film was of paper coated with a golatine brounds which became the negative and which was readily removable from the paper. But there was still a desire for more satisfactory film supports. The paper stripping films were objectionable on account of the not infrequent appearance of the grain of the paper in the picture and on account of the thinness of the film, which made it difficult to handle in the printing operation. In spite of the success striated by the paper film, they were soon displaced by a transparent dexilienitro-cellulose film support upon which the sensitive enulsion was fowed. This film was placed upon the market by the Eastman Company, but Handhald Goodwin claimed that he was its original inventor.

Goodwin took out a patent in 1898 for a photographic and process of producing it which by the Goodwin Flim and Camera Company, and which was made the basis of the patent infringement proceed-ing decided in favor of the complainant by Judge Hazel. In his patent, Goodwin states that a solution of nitro cellulose (not the commercial compound known as celluloid dissolved in airohol or ether) dissolved in nitro benzol or other non-hydrous and non-hygroscopic sol vents, such as may be employed in producing celluloid ns distinguished from collodion and diluted or other hydrons and hydroscopic diluent, is flowed over A smooth, transparent, impermeable film, cap able of being subjected to photographic fluids without being affected thereby is obtained. The sointion ob-tained by dissolving the nitro-cellulose in this non-hygroscopic solvent, is diluted with sleahol or some other diluent, which, like sleahol, serves to dilute or expand the volume of the dissolved nitro-cellulose and increase its fluidity, and which may be and ordinarily is hygrostone, miscible with water and highly volatile. diluted solution is then applied to a smooth and hard surface, from which it may be stripped when dry

Secuse of the high wolatility of certain elements cuntained in the solvents, they evaporated rapidly, leaving the pellicle more or less fluid, until the high beliar elements, which oraporates more slowly were also responsed, where upon it became hard, transparent, and soo-porous, and being without oil or greatines, resident the indirious effects of the photographic emission. The desired result was achieved principally through the high boiling quality of the solvents and that non-hydrous and non-hydrouset in the Tenet Office. These was considerable argument in the Facent Office,

There was considerable argument in the Patent Office, after Goodwits application for patent was filed, in an effort to persuade the primary examiner that a patent for process and product should be granted. The application was finally rejected in 1888. An appeal was taken to the Board of Examiners in Chief, and the diction of the Board of Faraminers in Chief, and the diction of the Board after over the sensing of the patent. The Board in the patent of the sensing of the patent of the Board in the sensing of the patent of the Board in the sensing of the patent of the sensing of the patent of the sensing of the sensing of the sensing of the patent of the patent

Long before Goodwin's day chemists were aware of the fact that chirch-bens old anyl acetate topesessed non-hydrous and non-hydrous properties, and classed them as solvents of nitro-cellulose, gnn cotton and pyroxchene. Goodwin, however, drew a sharp distinction between his solution and the solutions of collection or cellulaid, which was composed of intro-cellulose and complot or distinctly dissolved of efter or alcohol, and expressly disclassed the latter, all the while elatimity and intro-cellulose and an improvement in the specific combination of intro-cellulose dissolved in nitro-bensal or other non-hydrous or membry prospects solvents, and diluted in alcohol or its equivalent. In its decision the court adopts Goodwin's contention.

During the prosecution of the case in the Patent Office, Goodwin became involved in an interference with Reichenlanch. Reichenbach, who had no knowledge at the time of his invention of Goodwin's application, described life process as depocifing or spreading a third southern of interference outline on full recordulose and campion goan is suitable surface. He disclaimed the issue of the interference and canceled his process has been also substant of interference and canceled his broad claims. Subsequently letters patent were granted to Reichenbach, covering his specific process, ansaety a solution of intro-cellulose and campion in methyl or wood alcohol with a quantity of fracel oil and amyl nestate added. Goodwin had never exemblance of his solution to celluloid, which contains campion, the examiner decided that interference with new beautiful to the contains campion, the examiner decided that interference with his switchess of the contains campion, the examiner decided that interference with his switchess of the contains campion, the examiner decided that interference with the Reichenbach was proper. Precuming that his invadication had been allowed, Goodwin practically conceived the results of the contains of t

Meanwhile, however, the Eastman Company ide in accordance with the R keted film supports in enbuch process, and these supports were regarded as solving the problem and were used hirgely in place of The court held that "in departing from the sie elfic formula of its own patent, the defendent util the equivalent of the method specified by Goodwin in this patent and achieved the same result. The Reichenbach solution was concededly grepared with approximately 60 per cent of camphor, which, according to the decreased from time to tim per cent relative to about 22 per cent of altro-cellulose s decrease in the quantity of camphor sufficient to over come objections These objections were the cocking come onjections and pinckering of flus made in accordance with Reichenbach's processa. The court decided that the two processes "are not distinguishable in principle". The improvement in the flus support is due to the combinaof equivalent high and low bollers, and therefore departure in its production is merely within the score of the claims."

if the Kastman Company should lose this case on appeal, the present awners of the Goodwin patent may find themselves entitled to collect damages involving millions of dollars.

#### What Are the Ten Greatest Inventions of Our Time, and Why?

A Prize Article Contest Open to All Scientific American Readers

T 415 November Magasine Number of the Scienciary Amazaca is to be devoted in part to a review of the great inventions of our time. Because a inrea inmediate of Scienciary includes a reason of inventions, it seems to the Editors that their judgment of the inventions produced in our time which descrive to be called the greatest, their appreciant of the relative importance of the paramount technical achievements of our day, would be of pseudiar value and interest. Therefore, it has been decided to leave the entire subject to them

The publishers of the SCHENTIFIO AMERICAN offer three prizes of \$150, \$100 and \$50, respectively, for the three best articles on the topic, "What Are the Ten Greatest Inventions of Our Time, and Why?"

Contestants for the prize must observe the following

- 1. Each article must discuss and answer the follow-
- a. What, in your estimation, are the ten greatest inventions produced within the last twenty-five years? b. What are your reasons for this selection? Justify
- your selection in each case.
  c. To what person or persons is the greatest credit due in the developing and perfecting of each invention which you have selected?
- 2. The entire subject must be covered in a typewritten article not exceeding 2,500 words in length,

and must be treated as simply, lucidly and non-technically as possible.

- 3. In deciding what are the ten greatest inventions of our fine, the contestants are limited to machines, devices and discoveries commercially introduced in the last twenty-five years.
- 4 Since the Neuritric American is "the weekly journal of practical information," and its readers practical business men and inventors, the articles simulited should deal only with patentable inventions and discoveries.
- In order to guide the contestant in deciding what is a great pioneer invention of our time, it is sug that practical success and general usefulness to mult-A modern discovery been suggested long ago and its underlying theory even worked out mathematically, as in the case of wireless telegraphy, but nevertheless it falls within "our time," if it has been made generally accessible and asoful within the last twenty-five years. But commercial within the last twenty-five years. But o The flyas not yet added millions to the na tional wealth; but, for all that, it is a great invention of our time. Mere improvements on well-known and successful devices are not to be numbered among the great inventions of our time Because an invention was first patented more than twenty-five years ago it is not necessarily debarred. The date of commercial introduction not the date of the patent governs invention, moreover, need not have been netually patented, but its subject matter must be of a patentiable nature. Patentability is merely a test of commercial
- 6 Contestants must not disclose their identity. Each article must be signed with an assumed mane and must be accompated with a seated envelope, on which the assumed name is written, and in which the real name and address of the author is contained.
- 7 Contestants must address their articles, accompanied by the envelopes containing their real manes, to "The Invention Contest Editor of the Scientific American, 361 Broadway, New York etty" 8 The articles will be passed upon by a Hoard of
- 8 The articles will be passed upon by a floard of Judges, whose names will be announced in a future issue of the Scientific American
- 9. The Board of Judges will revelve only the articles submitted; the envelopes containing the true names and addresses of the authors will remain in the possession of the Editors of the Scientific Alagareas. When the judges have made their decision, the Editors will open the envelopes of the winning contestants and notify them of their success.
- 10. The decision of the Judges will be amounteed in the Peirstein America of November 1st, 1013. The prize-winning articles will be published in the order of merit in consecutive Issues of the Scientific American, beginning with the Issue of November 1st, 1013.
- 11 The Editors of the Scientific American reserve the right to publish in the Scientific American or the Scientific American Scientific articles which have not been awarded prizes, but which are deemed worthy of bosonvible mention.
- 12 While contestants are not required to supply pictures with their articles, illustrations will be council If drawings are submitted, they need not be elaborate, the staff articles of the Schrafter Amenica, will work them up for reproduction, provided the muterial supplied is intelligible. Do not send pictures ton from books and periodicals; they cannot always be reproduced and periodicals; they cannot always be reproduced and periodicals, and their unauthorized reproduction may conditute a copyright infringement. If photographs marked "copyright" are sent, they should be accompanied with the copyright on ser's written permission for their reproduction.
- Members of the staff of Munn & Company, incorporated, publishers of the SCHENTIFIC AMERICAN, and of Munn & Company, solicitors of patents, are excluded from the contest
- All articles will be received up to 5 P M., September 1st, 1913.

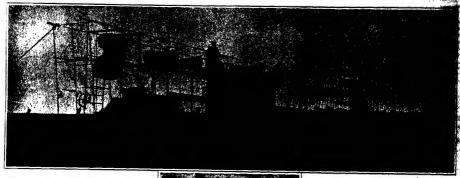
#### The Current Supplement

N this week's been of our Supranaeve Prof. Law-rence Martin of the Talversity of Whoresian, who has been leader of several Almskin expeditions, writeon glaciers and the effect of their measurements upon international boundaries—11. M. Nichols contributes are
raticle on the insulatation and care of storage stateries.
—Many of our readers will take a personal interest in
a discussion of the advantages of electric light as compared with gas for motorcycles.—Robert F. Pierce
reports on the preparation of n source of artificial daylight by the use of suitably chosen light filters
—Almetenant Colonel J. E. Kum contributes the first
instalment, desting with truthe by land, of a series of
articles entitled "Some Aspects of the Subject of Transportation."—In last week's issue we had an excellent
review of our present knowledge of the blood as it appaars in beath. H. G. Pitinmer tells us something
this week about the blood in disease.

# Dissecting a Military Dirigible Airship

An Interesting Experiment With the New "V1"

By Dr. Alfred Gradenwitz



N interesting operation was recently performed. A when the German dirigible "VI" was taken apart in accordance with military regulations, thus bearing out the designer's claims that the ship is a "knock down" craft

The aerial cruiser, which in appearance resembles a rigid already of the Zeppelin type, had landed in the vicinity of Julich. Her crew, assisted by twelve men, began on the same evening the detaching of the keel began on the same evening the detaching of the keel and the evacuation of the gas envelope. On the follow-ing day, the keel, consisting of steel tubes, was un-screwed, the virtuous sections being loaded on farmer's wagons, which by the following toon reached the Dis-sident airship shud. The distance covered was 33 miles. After a day's rest, the keel was replaced by the same crew. The whole performance spoke well for the remarkation success of this new military airship type.

type. The "VI" has been built according to the Yeeh patents and is of the semi-rigid type, combining, it is claimed, the individual advantages of the rigid and non-rigid systems and svoiding their draw-backs. The gas capacity is \$500 cubic meters, the length, about \$0 meters, and the maximum diameter, 18 meters. The main distinctive feature is a stated beautiful to the part of the part o indeters, and the maximum unmerer, is mevers. The main distinctive feature is a rigid keel frame constitut-ing a covered gangway limmediately below the envelope Easy access to all parts of the craft is therefore secured while under way, and at the same time an artificial stiffening is provided which does away with the necessity of any additional cars. This frame, which forms, as it were, the breasthone of the whole airship, not only permits the load to be distributed as desired (arranging e.g., the ballast and fuel in small tanks in any part of the keel), but insures an advantageous arrange ment of the steering mechanism, far away from the center of rotation at the stern, without overloading the

The envelope is a single large gas-compartment and is fitted with two auxiliary ballonets intended primarily to maintain the proper gas tension, while serving as well, in cases of emerg-

eucy, for changing the att. The shape of the gas bag is preserved in the usual way by two self-con-tained centrifugal blowers, means being provided for each venthator fan in be driven from one of the two both the fore and aft bal-lonets. The blowers and gas hags are controlled by the pilot. Hand operation has likewise been provid-

Normal steering in a vertical direction is effected by means of planes arranged like Venetian The keel is strong enough to carry without any support the weight of all planes, with an ample



The "VI" in flight.

and revolve at the rate of 350 revolutions per minute.

They are supported in ball-bearings in lateral brackets on the keel frame, as high as possible, e. g., as close as possible to the center of resistance.

#### Air Strength of Russia

margin of safety. The two points are able to rope, etc.), but in the event of the balloon being torn, the

wind pressure on the stabilizing and rudder surfaces Actual load tests have shown the extremely high bead

ACTIBIL IONG LESIS ARY SHOWN [The EXTERNISY DIGHT SHOWN IN STREET AND ACTION IN STREET A

envision.

The engine plant comprises two entirely separate and self-contained four-cylinder sets each of 190 horse-power. Bubber ropes are employed in the transmission, it may be said that rubber rope transmission, as used for a number of years with most satisfactory results, as the advantage area house runs transmission of the contract of the con

for a number of years with most assuspactory results, has the advantage over hemp rope transmission of be-ing absolutely weather-proof and of undergoing no variation in tension by moisture. A large safety factor has been obtained in connection with this propeller

drive, triple roles being provided so that even should two be torn, the corresponding propeller will not be disabled.

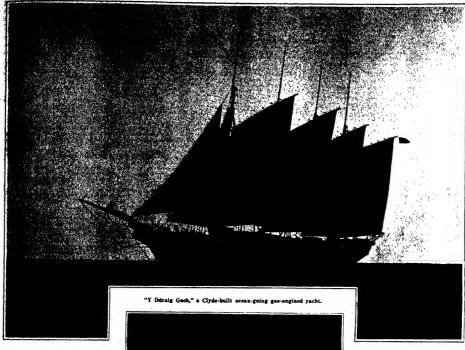
tribute the weight uniformly over the who

A CCORDING to the London Times in the Duma on A June 24 the chief of the general staff, replying to sumerous inquiries, stated that in the course of a year, since a department for aviation had existed in the istry, the number of aircraft had increased tenfold.

ministry would not rest until a flying detachment The ministry would not rest until a flying detachment had been established in every army corps, to carry out scouting operations in time of war. The ministry had

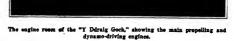
seized the first opporto double the name dirigible balloons at acquired alrabine, kind known as "dreadnoughts," o newest type. These were fitted with the latest im-provements, and were prograntite someraine



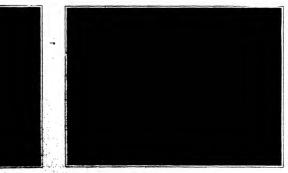


#### Gas Engine Yacht By Robert Macintyre

THE vessel pictured in this article, is a proper to the proper several respects unique. Whe is "Y Ddraig Goch," which is Weld for "The Red Dragon," and was built on the Clyde from designs by Mr. William Gray, a well-known British naval architect, for Mr. Godfrey Williams of Aberpaym. Mr. Williams is a wealthy Welshman who has inherited from a long line of bearers of his name iands in South Welse which are rich in coal, especially anthractic. His bobby is ocean crusting, and he has in his day owned more than one large yealt. None of these quite pleused him, however, so he set about the formulation of his requirements and handed the result over to Mr. Gray to be embodied in an ocean-going yealt. "Y Ddraig Goch." is the yacht.



Rigged as a four-musted fore and aft schooser spreading some 20000 square feet of canwas, excluding bulloon suits, she is 200 feet long, 38 feet brand, by 21 feet 6 inches deep, displaces 1,000 mas, and measures 1,000 tone trees. The arcommodation for the ewiver and his friends is artistically decornized and elegantly furnished, the furniture consisting of reproductions by a Ludoni West End fran, of exhibiting examples of the period of Willliam and Mary. Most of it is in wahnt the dining room is in white commed with pushed depicting ancient ships. The drawing room is framed in wahnt. Elsewhere, except in the chart room, white is preferred, an excellent effect being obtained in the children's room by adorning the puncles with defleately traced pictures in pale blue of hunting scenes in olden times With all this selegance of accommodation



William recent of the "I Darrie Goth," finished in white enamel

Drawing room of the "Y Ddraig Goch," framed in walnut.

"Y Merity Goch" combines the structural strength of a mercautile ship. She has isen built, indeed, to Lloyd's highest class for solling ships, and in excess of the requirements her main deck being for the greater part of its length watertight. She is the intracts motor mutilitary yacht ever built in fairopean waters, and the first of any slot to be propelled by means of a gas cagine. The power for her motors is produced on board from anthractle coal, of which she can carry in watertight bunkers sufficient to take her round the world motor power slone. As the fuel is used the bunkers are utilized for water ballast.

The main propelling engine is a sixcylinder type of 100 brake horse-power, and it drives a feathering propeller through a clutch. A less powerful fourcylinder engine of the same make drives a dynamo which provides the power for lighting the ship and working the deek machinery. In order that there may be no need to use this smaller caughte at night, a secondary battery has been fitted, which is equal to the work of the whole of the ship's plant for twelve hours. The main engine can be disconnected from the propoller shaft and need to drive an nuxiliary dynamo.

The vessel is heuted and vontilated by means of theorematics, which are, in this lineauce, and for the first time if a yacht, adapted to the me of sen water in tropical climates. The temperature on board can never be more than 2 or 3 degrees in excess of that of the sea water. Nothing which the owner's experience of senfaring could suggest has been left unprovided, down to roller reeding zen on the booms. The yacht, which is now cruishing in West Indian waters, has proved herself to possess flue weatherly qualities, and her gas Plant has so far given excellent results.

#### Bird Castle Built by a Blind Man

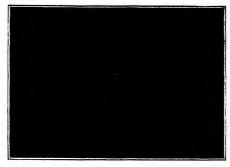
THE accompanying photograph pictures the work of a man deprived of eye-sight who have devoted his life and means that the substantial of the subst

#### Detroit's Novel Pay Car

B ECAUSE of the robbery of the patrolmen who were formerly sent with the
pay envelopes for the cit; labores, the
city of Detroit, Mich. has forestalled
further hold-up by Installing a pay car
of unique design. It is an automobile,
strongly built with inclosed body and
harred windows. The entrance which is
in front is gnarded by two armed purrolmen, one of whom drives the car as well.
The interior is conveniently arranged for
paying off the men, and the cashler site
at a swivel chair with his compartments
full of indexed envelopes on either side,
and a small paying ledge in front where
the men line up to receive their wages.
The car is the first of its kind, but will
probably not be the last, as it seems to
meet a public need

#### Benzine as an Aid to Red Blood

A CORDING to the observations of Barker and at a later date those made by Seiling, benzine has a marked action upon the corpuscies of the blood; in fact, it is found to destroy the white corpuscies without much action on the rod. These results led You Koranzt to use benzine in cases where the blood contains a greater number of white corpuscies than the normal amount, this causing the discussion of the companion of the companion of the contained in 1912, gave good results and confirmed the previous authors' observations. Since that thee Aubertin and Parru found a lessening of the white goopneies and an in-



Collecting cream for the college dairy.



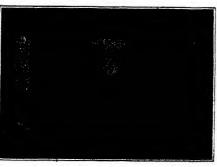


A 102-room bird house construct by a blind man,

Car end of a single piece of pressed



Paying off laborers from a city pay car. .



Interior of the pay car. Note the strongly barred windows.

crease in the number of red corpueshed to terminal flowes of beninken in the ense of two patients, and this injection may like called tupo to replace reduce two may like called tupo to replace reduce two the way like corpuedes fell from \$85,000 to 0,400 fm sevent weeks, and in another case from \$13,000 to 7,200 in 13 days. Not mode than a few drops of benince per day should be administered in order to avoid poisoning by this substance.

#### A Motorcycle Milkman

A 8 IS well known, thousands of strA dents in colleges and universities erra
enough money by working at different
insite to defrey part or all of their expenses. There is a wide variety in the
work done by the entdents and sometime
a good deal of originality is disposed at
the Kansas State Agricultural Case
who owns a motorycle has found that he
can make use of the machine in co-oparation with the college dairy, doing a mile
and creamery business. Beades deliveing milk and cream to customers in town,
he makes rams into the country on his
motorycle, going out as far as twenty
miles to junctase cream from the farmers
and bring it back to the college. The milk
and cream is carried in case hung over
the rear wheel of the motorycle, as
shown in the accompanying illustration.

#### One-piece Steel-end Freight Car

STREIL is rapidly displacing wood in the construction of railtroid care-moin only in passenger cars where the safety of the passenger cars where the safety of the passenger is an important consideration, but in freight care as well. The accompanying liberation shows a freight car, the entire end of which is made of a single place of steel pressed with concentration and a single place of steel pressed with concentration and a single place. Not only is at stronger than a built up end would be, but it keeps the car in alignment and allows, furthermore, an additional foot of space within the car. The end piece is applicable to any class of car old or new, as it can be made in different sizes. It is fastened to the rest of the car body by means of boits or rivets which pass through flagses at the edges, which pass through flagses at the edges.

#### The Origin of Screws and Gears

REMONT, in his recent work on the origin of screws and genrs, brings out interesting points on this subject. The Greeks are supposed to have invented the screw, but the two Roman authors, Pliny and Vitruvius, give the most ancient record we possess on the subject, although it must certainly have been known long before their time. Certain authors think that the idea of the screw comes from ob servation of a natural object of helical form such as a gasteropod mollusk, but Fremout thinks that it arises from forms in movement. For instance, when an edi-ble snall is drawn out of its shell, we have the idea of screw and not. Unfor-tunately the ancient records throw scarcely any light on the subject. The principle ly any light on the subject. The principle of the screw seems to have been but little used until the middle ages, when it was first applied for wine or cider presses. During the first centuries of our era

During the first conturies of our erabolt and nut was replaced by threadless bolts having a hole containing a conical juln, so that driving in the pin increased the pressure; such bolts had holes spaced along for adapting to different thicknesses count for the origin of gearing. This seems to have been a wheel working on a horizontal shaft and operated by a creak. Along the wheel surface were clear for retaining the broket chain which descended into the well, and in this way the buckets were raised, one after the other, full of water. But to drive the sories by an animal makes a vertical shaft necessity, and an ingenious person may be extended the clears on one side is the same contained the clears on one side is the same contained the clears on one side is the same contained the clears on one side is the same contained phase placed as a vertical state; to

TOTAL CALMADER AND



Scorpions in battle for possession of a captured cockreach.

# How Insects Fight

Stings, Mandibles, Horns and Poisons in Warfare

By Percy Collins



The grotesque rear-horses or mantids in combat.

About one half natural size.

MOST animals fight when occasion demands, and Indeed, many insects must be regarded as accomplished warriors, equipped with weapons of uncommon efficacy, and versed in all the strategic arts. Those who have and versed in all the strategic arts. Tunes who have puld attention to the warfare of insects are aware that that epotests may usually be classed under one of three headings: they are either (1) purely defendive, or (2) an outcome of the courtain instinct, or (3) definitely aggressive. Certain insects, however, appear to labor under the influence of a veritable mania for battle Amoig these are the well-known reer-horses, or man-tids, whose fore legs are so remarkably modified to act as reptorial implements. With these terrible limbs, which are binged and spiked in such a manner as to combine the attributes of the flail and the skark's teeth commine the attributes of the mail and the skark teem sword of the Pacific blanders, cent-horse capthre and hold their prey; but they are also used as weapons of offence and defence. It is said that two rear-horses scarcely ever come face to face without fighting. Moreover, the contest is not merely a display of skill, but n duel to death. Sooner or later one of the combatants gains a momentary advantage, and seizes its opponent This puts an end to the battle; for the victor never releases his grip, but begins at once to make a meal of his opponent. Nor are these affairs confined to the members of one sex. The femule rear-horse often, if not usually, tires of her accepted suitor; and when this happens she rushes upon him with menace. The male attempts to defend himself, but as he is smaller and less robust than his spouse he is generally defeated Subsequently, the female calmly devours her quondam mate. Beyond these conflicts for prey the mautids are

Among the jursty defender appliances of insects none is more interesting than that possessed by the so-called bombardier bestiew of the gaune Bruckinson. These insects are carnivorous, and destroy small Arthropods of various kinds: but they are themselves preyed upon by larger beelles of their own family. When one of the hereditary sensite gives chose, the bombardier runs rapidly away. If speed were its only chance of escape, however, it would stand but a post chance. But nature has endowed it with a romarkable defensive equipment. It is able to oper an acid finish from glands situated at the tip of its abdomen. This find vaparities immediately on contact with the air, and looks like a tiny puff of smoke, while at the same time a datafort report is heard, reminding one of a miniature cannon. The beetle is able to repeat this discharge several times in rapid succession before its store of amminition becomes exhausted. In this way the little artilleryman is able to disconcer its would be captor, and very often contrives to rush into a ranno, or under a stone, where the enemy cannot follow. The acid discharge of certain large South American bombardiers is extremely counted. It turns and stains the human akin, leaving marks which remain for a considerable time.

for a considerable time. The most formidable weapon possessed by insects is the polson sting. It is only found among the hitcher hymenopters (i. e., insects of the bee and weap kind), and is confined to the femnie sox, heling, in fact, a modification of the originate of the original papers of the original confined to the femnie sox, heling, in fact, a modification of the origination, and is present a parts working in conjunction. There is a growed and pointed shaft, along which silds two darks, more releast barbed. The shaft is first used to open a wound. Then the dark are plunged eiternstely into the tissues, while an acid secretion flows down from the poison-sac. Like been and wangs, some species of ants are equipped with stings, but others lack these weapons. The polson-sac serves merely as a received whence formic acid is squired from an orifice at the tip of the abdomen. These stingless auts, therefore, first bite their enemy with their jaws, and then spray polson into the wound —a somewhat cumbersome method, involving two separate and distinct operations. But ants are very saffe, while the extraordinary factibility of their weals" (i. e., the poglou between the thorax and the abdomen) canbies them to direct their poisonous discharge to almost any points of the compass, Moreover, stincing and points of the compass, Moreover, stincing and the standard, the sould be standard, the straight samples of deviations, and dept their formic services.

acid into the air. The pungent fumes tend to disconcert and drive away the enemy; and there can be no question that ani-battles are often won without the indiction of a single wound.

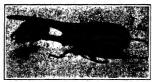
Ants are probably more aggressive than any other insects. They constantly make rules upon noithworing mosts, and pillage the stores. Some species, as is well shown, Actually engage in comparigate for the sole purpose of obtaining a supply of slaves. Slave-making auts nountly attack the communities of species smaller than themselves, and after terrorizing or driving out the shall inhibiting, carry of all the grabs and impre-



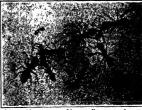
East Indian male beetle with developed forelegs for arresting the female.



The acid discharge of a bombardier ant disconcerts



The giant hercules beetle carrying off its mate.



Slave-making ants attacking smaller ants and carrying off pupas.



Male stag bestles in courtship warfare. The victor

that they can find. These they convey to their own and when the mature and appear, they are caused to play the part of domestic drudges in the post of their cuptors. The slaves prove themselves industrious and docile, and it is a remarkable fact that, although they are apparently free to come and go as they please, they never attempt to escape. It has been proved that certain ants are completely dependent upon their siaves. They are fed, cleaned and even carried about by their indefatigable helpers, and if by chance they should be deprived of this assistance, they abso-intely refuse to cal, and soon die. One rare European aut has no worker caste. After mating with a mule, the female obtains access to the nest of another species. She then kills the rightful queen, and (by what arts has not yet been discovered) contrives to ingratiate herself with the worker population. The last serve their new inlstress faithfully and lend her offspring; but as no more worker eggs are laid, the prosperity of the kingdom steadily declines. Before its that dissolu-tion, however, the alien queen will have become the parent of a numerous progeny which will saily forth at the appointed season to accomplish the downfall of other nexts. The usurper and is called Incomates atta-tulus, while the species which it victimizes is Tetramonium caespitum

The contradity warfare of mule baseds is especially interesting. Among the "State feetlers" of the family Lurander, several mules often light desperately for possession of a female, buffetting one modules with their enormously the edged namidities, and exhicing no little skill in their methods of allack and of defence in the heliahl of the breeding season, these lunests are so much occupied with their rivalry that they seem to lose all senses of fear. Thus, a cuntion solective may often witness the duels, and even obtain photographic records of them. In the presence of a female, two male stag-levelies have been known to fight upon the surface of an ordinary table, before the lens of a consense, and the season of the season of the season of the female with the family and push of carry her to a

In many cases the strangely shaped "horns" which are carried by seurable beetles upon the head and thorax appear to be specifilly provided as implements for holding and translocating the female. The mildry Hercules (Dipantis heruch)—one of the hirgest known beetles has been seen to carry off tils unter he this was, after having won her in fult fight with his rivals. The nucles of other heetles, such no the species shown in the necessary in the protograph, have specially developed forcelinate for ransping photograph, have specially site should prove cov at now time and attempt playfully to run away.

Scorphone are not insects, but they are sufficiently close in relationship to be included in the subject of this article. But are most interesting creature in captivity, and if several specimens are keep their meli-node of warfare may be studied. In the photograph reproduced herewith, the right-hand scorphon has seduced a cockroneth, and historiand scorphon has seduced a cockroneth, and historian defensive attitude, prepared to fight for its booty with a hungry rival. Note the cuttons advance of the batter, with independence of the stage and their way of the stage and the stage of the stage and the stage of the stage and the

#### Blondel Becomes an Academician

THE French Academy of Sciences recently elected to Arabel Prof André Bludel as a member in the place of the deceased savant Callietet. This well known selected is expected by the place of the several by the electrical field, and he occupies the first rank among electrical physiciets for his researches upon electrical waves, resonances, synchronous undoes, photometry and the like. What is remerkable is that he is bed ridden for the last ten years, and directs his pupils and assistants in the constructor of the electrical apparatus which havents, among the most remerkable of these being the oscillograph for observation of the forms of electrical waves and their photography.



## The Motor-driven Commercial Vehicle

This department is devoted to the interests of present and prospective owners of motor trucks and distoury imagens. The Batter wall emissions to automate any questions relating to mechanical features, operation and management of commercial motor vehicles.



Hook-and-ladder truck hauled by a gasoline tractor.

#### Advantages of Tractor Transportation

IN the early days of practical motor trucking, which, incidentially, were not so far back but that they are easily isrought to mind, it was by no means a trivial matter to construct a machine that would operate consistently and economically under normal working conditions. If a truck would do what it was built to do it was silt that was expected it did not take long, however, to discover that the lond actually carried on the londy of a truck did not call for the evertion of anything like the normal power of the motor under ordinary minding conditions, and that a radier, coupled up behind the loaded truck, cauld well earry a very substantial separate lond and be hauled at reasonable speed without over-taxing the motive power, though of course, the hill-climbing ability of the machine would be

correspondingly curtailed.

Some idea of the londs that can be handled in this way may be gained from the fact that is shadord fleven truck has handled a trailer fond of 45 tons, including the trailing while, and even this does not represent the greatest weight that has been trailed by a five-ion machine. Obtying such a powerful transportation system could not well be neglected, nor has it of late years the trailer principle, with various modifications, has received much attention and excellent results are being obtained in actual covery-day work.



Five-ton truck with a lumber trailer.

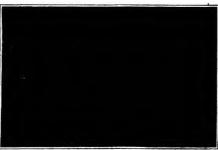


Gas-electric tractor; a motor in each inclosed wheel.

While in Europe the warou train, consisting of a tractor and several trailers, has been quite extensively developed and employed, in this country more attention has been given to what may be termed the semi-trailer system. Briefly, the semi-trailer unit consists of a motor truck, usually having a short-coupled chansle, carrying a sort of fifth-whoel or turntable on which is mounted the forward end of a two-wheeled trailer; the whole of the load is carried in the body of the two-wheeled trailer. By calculation as to the position of the turntable on the chassis and on the trailer whoels, any desired distribution can be effected, and the noit has the advantage over the ordinary truck-and-trailer outfit that it occupies considerably less space, is more easily maneuvered and is less expendive to construct. The rear wheels are of ordinary wagon construction with steel three, though it is necessary to employ considerably heavier wheels than would be required for horse trucking because of the increase of speed and the high mileage obtaining with the use of power.

The steel-tired rear wheels, coeting, as they do, far less per mile than the rubbertired wheels of the truck proper are made to carry the greater part of the lead, the weight on the chassis being just sufficient for good traction. This makes it a simple matter to proportion the lead on the rubber tires we that they will work under

(Concluded on page 270)

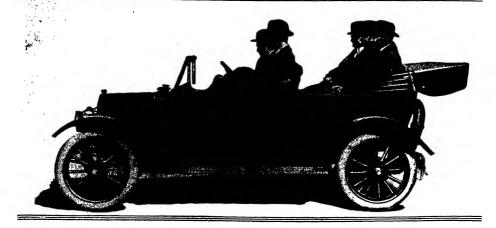


Motor truck with short-coupled chassis and two-wheeled trailer.



Three-wheeled electric ask cart.

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We are now under way. Factory capacity will rapidly increase. We are laying out our plants for 500 cars per day of this model. Can't reach that in a day of course. But this means that within 18 months we will be the largest producers of light touring cars in the world bar one.

And, as we said, this is a real automobile, with 3 speed, sliding transmission and other features that you know as standard in high class cars. Looks the part, too, and that's an item.

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#### Advantages of Tractor Transportation ded from page 168.)

favorable conditions. It is known that a truck of this type, having a capacity of months on a single set of tires, and ever then only two were unfit for further ser vice, the two front tires remaining in ser vice for four mouths after two new rear tires were applied. This of course results In a very marked operating economy, as tire expense in heavy trucking is a seri-A machine of peculiar design that ha

been evolved especially for service as a tractor has but three wheels, the two in the rear being drivers and the single front wheel of course the steering wheel So far as the rear end of the tractor is concerned, it resembles the ordinary type of gusoline truck with final drive through sprockets and chalus, and the mo-tor housed in the conventional bood with the radiator in front. The single front wheel, however, serves to give the machine a decidedly unusual appearance. A forward extension of the frame—or, more correctly speaking, a separate steel custing riveted to the forward end of the main frame—carries a socket in which turns the shauk of a heavy fork straddling the front wheel. The fork structure is not continuous to the wheel indi, but on each side there is a full ciliptic spring which provides an elastic suspension. Steering wheel which is connected to the top of the fork pivot through a long shaft, which passes over the top of the motor hood, and reducing gears contained in a casing at the top of the socket. For service where conditions affecting traction always are good this tractor is fitted with steel tired rear wheels; more commonly, how king-rdn and jurntable upon which the front end of the truller member rests are directly over the rear axle; the axle and wheels of course are proportioned to carry the load, while the front wheel is loaded only sufficiently for steering purposes, and its load is practically constant, regardless of the weight curried in the trailer body

For some years the gasoline-electric or mixed system of propulsion has been h hicles of this type, with four-wheel drive and steer, have been successfully put into service as tractors and semi-tractors. Iu one such machine the engine, mounted under the floorismrds and the driver's seat, is direct connected to a generator, which supplies current for four electric nuctors, one being inclosed in each of the steel disk wheels. Each motor is, in ef-fect, part of the stationary axle and its armature remains in a horizoutal position while the wheel rotates around it. Each end of the armsture shaft carries a pin lon, and each pinion meshes with a large genr ring on the Inside of the wheel, clo to the rim. The armature necessarily is slightly skewed so that the pinions can singuity skewed so that the pinions can nesh with opposite gear rings and thus both drive the wheel simultaneously. An equalizing device in the armature shaft permits slight relative movements of the pluions in the manner of a differential Kenr Vehicles of this type also are fitted with batteries, the battery machines being suitable chiefly for comparatively short

distance service A tractor with four-wheel drive and steer, dividing the work, as it does, be-tween all four wheels, requires a differcot distribution of weight from a rear wheel driven machine. Therefore turntable carrying the front of the body ls so located that the rear wheels receive but little more weight than the front wheels. The advantages claimed for this arrangement are that as all work is divid ed between four tires, no one or no pulis overloaded or overtaxed, but rather, all are working under favorable conditions. Further, the four-wheel steering system is said to facilitate maneuvering in close quarters and running in the reverse. The convenience of electricity as a motive power for auxiliary purposes has led to the installation on these trucks of a number

of electric hoisting bodies, winches and the like.

While a short-coupled chassis such as

While a short-coupled chassis such as in used in both the cases referred to usually is been dapped to semi-tractor work, it by no means follows that a long or standard chassis will not answer the purpose. On the contrary, not a few standard ister trucks are employed, either standard site trucks are employed, either model of your inventions and selections. One of the purposes to which they are particularly well adupted is the handling particularly well adapted is the handing of long timber, which cannot be mounted ou a single body and, besides, often is of greater weight than can well be carried by a truck that may be well able to haul on a trailer.

One of the niches that the semi-tractor has filled very satisfactorily is that of mo-tive power for very heavy fire apparatus, the horse-gear and front wheels being re-moved and the front of the apparatus mounted on the turntable of a semi-trac tor. The great weight of these pieces has made them clums; and slow-moving when herse-drawn, besides being capable of mov lng only forward, in m plication of the semi-tractor has convert-ed them into modern motor-driven machines at a cost far below that which would be incurred in building complete new pieces, of similar design but with mater propulsion built in. Water towers, hook-and-ladder trucks, steamers and other types of fire apparatus have been equipped to this way, and many such are in constant service

Front wheel drive, which of course em-

holles the tractor principle, is receiving for more attention at present than it has In the past, largely, no doubt, because me where the difficulties that formerly were or less buffling can be overcome. The electric systems, with motors mounted as units with the wheels, are readily applicable to front-wheel drive, but there also ure several mechanical driving system that inve given good results. French system, for instance, which is being introduced into this country, show the capabilities of the principle A motor with transmission gearing, change-speed ed on a pair of wheels, together with the driver's seat, gasoline tank, radiator and so on. The tear end of the short is extended in such a way that aim . The tear end of the short frame is sort of body can be bolted in place, the body of course having its own wheels, which may be, and preferably are, if econconsideration, of the ordinary steel-tired type. The weight of the power plant is so behaved that the body has

Drive from the vortical four-cylinder motor, which is placed in the conventional position, is through a cone clutch and a sliding gearset operated in the usual manner. Flual drive is through a cross shaft which carries spur pinions meshing with sour genra bolted to the wheels. Universal joints located in the planes of the steering plyots permit steering and drivlug at ouce. The gears are of course lu closed as well as the cross-shaft and its joints; incidentally, there also are universal joints where the shafts emerge from the differential housing, so that all possible disaliguing strains are provided

employed in a machine that has the dishas been built in this country, and is used by the railroad company that constructed city streets where a locomotive is imprac-ticable. The huge tractor, which drives and steers through all four wheels, de-rives its current from a storage battery und weighs fourteen tons, has a moto for each pair of wheels, driving through reduction gearing and cross-shafts universally jointed. The joints are peculiar in that they are inside the pinions in er words, the pinlou forms the outside of the joint. Obviously the pinions are directly in line with the steering pivots. Steering is effected by means of a wheel of the marine type located in a can that of the marine type socsed as a can be made action the has the appearance of a regulation that facety in Rife the boat pilot house.

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ntile-decorating retailed alone card welting.

Still another application of the front wheel drive system is found in the conversion of the two-wheeled ash carts that are familiar in most large cities to bat tery trucks. A heavy fork, with geared steering mechanism, is mounted with a wheel in which an electric motor is in-closed, the wheel being similar to those in the electric tractors already referred to. The construction is extremely rugge is necessary with the class of drivers that must be put on ash and rubbish carts, and there is nothing that exposure to the weather can affect lujurlously.

The Fire Convention at New York THE annual convention of the Interna-tional Association of Fire Engineers, which assembles in New York city during

the first week of September, will be of interest as emphasizing both the import-ance and the status of the fireman and the fire department in present day American life

Aside from the glamor of excitement and heroism which always has been con nected with the profession of fire-fighting, there is now an economic and engineering side that is becoming increasingly promi-nent, so that the modern fireman with nent, so that the monern bremain with motor apparatus, high-pressure mains, spe chal permanent equipment within lofty tower buildings, fire drills in crowded fac-tories, and other twentieth century conditions, not to mention his work in securing proper and safe building and maintenance, is a very different person from the roughand-ready worker with undaunted physi-cal courage of a not distant past. Indeed, in the general awakening of interest in conservation and municipal efficiency, the freman is not the feast concerned, for he of all public servants realizes that his true rôle is not the horole fighting of spectacular and devastating confiagrati

but the prevention of all outbreaks of fire. Unfortunately municipal authorities, unwilling to lock the door until after the theft of the borse, too often fall to give proper attention to the demand of the fire man for adequate equipment and to his suggestions for effective building regulasuggestions for enective building regime-tions and the enforcement of safe condi-tions of maintenance. One has but to at-tend such a convention as this to realize how earnestly the better grade of fire chiefs are devoting themselves to the lmprovement of building methods, and how they are according the engineering as well as the practical knowledge now demanded in their profession. It is in this connection that the coming meeting in Ne tion that the Comma accretion with the professional papers presented and discussed in formal session, for it will be held in a city where the technical side of fire-fighting has been highly developed Here a fire college is maintained for the instruction of officers and men of all ranks, an institution by the way which not only is being copied, but is utilized for training officers of other cities. In this fire department, motor equipment has been developed not for racing but for practical developed not for racing but for practical service. A high-pressure service and a large flect of powerful fire-basts have made a very widespread confiagration practically impossible.

All of this represents n branch of muni-cipal engineering of a high order. The same problems are also interesting other cities, so that the fire chiefs from the cities of America, Canada, and Europe, much to see as well as much to give from their own experience. Not only will then be demonstrations of equipment and meth ods in addition to a large exhibition in the Grand Central Palace, but an elaborate series of practical tests of apparatus from many manufacturers carried on by mechanical engineers so as to secure comparative and valuable rest

Disinfecting Eggs.—A Magdeburg, Germany, inventor, Walter Kulenkampff, has patented, No. 1,063,043, a method of prepatential, No. 1,000,000; a mylinch the eggs are disinfected internally and externally by evacuating and then filling with a greeous disinfected mylinch proposed with the proposed with the proposed with the company of the proposed with the company of the compan



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# Removable Equipment

for Firestone Truck Tires is all built to S. A. E. standard—with parts interchangeable—all at your service immediately. Your truck tire equipment—no matter what it is now—can be changed to Firestone without much loss of time, and to your decided profit in wonderfully improved tire service.

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Hard Rubber Base Channel Type

More than any other part of the truck, tires are affected by all the abuses of everloading, rough pavements, careless driving, etc., as well as by the grind of day-to-day traffic.

To prevent time losses—money losses—Firestone Truck Tire service gives quick replacement facilities.

Firestone Dual Notched Tread—shown in the large illustration—supreme for heavy service. Overcomes the bulge, or traction wave, that tears ordinary tires away at the base. Increases mileage, saves gasoline, reducestruck upkeep. Cured in Firestone Quick Removable Rim, thus insuring perfect seating.



Single Side Wire-Channel Type

Firestone Channel Type—Hard Rubber Base—on Firestone Quick Removable Rim. Has dense, tough tread built on a hard rubber base and cured in saw-tooth channel the sides of which afford protection against side abrasion and add strength to the union between rim and tire. This is an exclusive Firestone feature. This tread is built up of thin layers of sheet rubber and then cured into a solid unit. Resiliency is just right to protect the car. Insures maximum mileage under the heaviest service that can be put upon it.

Firestone Side Wire—Removable Block Tire—the recognized standard equipment for heavy motor-driven

or horse-drawn fire apparatus. Firestone quality of rubber and merits of the Firestone side-wire fastening device have placed these tires in their commanding position. They are increasing fire apparatus efficiency and reducing its maintenance cost in more than three hundred progressive American cities and towns.

European Type Dual Hard-Base — European Type Hard-Rubber Base — these and all other Firestone Tires for thorough truck service present a superior quality of rubber and all materials, and a general character of the highest standard. Your truck tire questions will find quick, easy and profitable solution in "Firestone."



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# The way in which the world is receiving the 1914 Cadillac, the wonderful manner in which it is performing, presages an unprecedented Cadillac year

There never have been enough Cadillacs-there surely will not be enough of this new 1914 model

In the year closing June 22nd the Cadillac Company manufactured and distributed 15 007 cars

Several thousand buyers anxious to own Cadillacs were compelled to be content with other cars

It was the story of the previous year all over again in spite of increased production

And the story of the year before-and the year before that

Each season the same thing has happenedthousand more Cadillacs could have been distribu ted had we been able to produce them

Intending buyers disappointed in securing Cadillacs have been numerous enough to constitute almost the entire clintele of some other cars

For 1914 we plan to manufacture 18 000 cars

It is perfectly obvious that Cadillac history is not only repeating but surpassing itself

Reports from all parts of the country make one thing perfectly plain, to wit That the accustomed Cadillac demand has been inten-

sified into downright eagerness This is due to evolutionary developments in the new car

Most potent among them is the marvelous influence of the Two Speed Direct Drive Axle

Every one who rides in the new Cadillac recognizes im mediately that its well known smoothness has been supplemented by an entirely new riding quality

This is demonstrated at once, even to the inexperienced

Going even at high speed the passengers discover that motoring in this new Cadillac has lost its sense of

Unless the eye is on the speedometer, one is apt to guess that the car is going at about half its actual rate of travel

Mentally and physically, driver and passengers uncon sciously relax, revelling in the delight of a new and luxurious sensation, oblivious to the almost watch-like mechanism

And on the heels of this delightful discovery come others equally pleasant

The owner finds that this Two Speed Direct Drive principle influences almost every Cadillac function which contributes to ease efficiency and economy

It not only brings into being a new degree of luxury but accomplishes an abatement of operating cost

The slower engine speed results in greater power gen-erated from a given amount of fuel

The slower moving parts means less friction

Both of these mean lower fuel consumption

But above all else is the contrast between the Cadillac and the average car with the ordinary gear ratio

The trembling oscillation of the latter is transformed in the Cadillac into a straight ahead steady motion which reduces vibration almost to the vanishing

A simple electric switch changes the gear from low to high and like magic there is added to any given speed of the engine an increase of 42 per cent in the speed of the car

Now-recall to your mind the high repute in which the Cadillac is held

Remember its record for workmanship almost miracu lously fine for strict standardization of its parts for alignment of its units

Remember its reputation for staunchness for dependa bility for long life and for the supreme satisfac tion and service which it renders to its users

Remember its reputation for economy of operation and maintenance

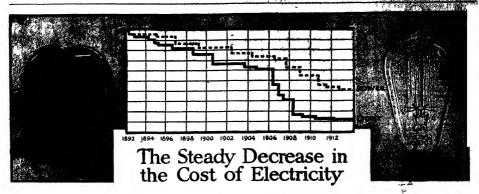
Remember the stability and the ideals of the organizi tion behind it

Consider all these things stimulating the rivalry for early deliveries

And then try to conceive the effect of this new revela tion of Cadillac progress added to all the others

You will realize then that we are acting in your inter est when we advise you to book your order now even if you do not wish your new Cidillac de livered for several months

#### STYLES AND PRICES



"They say you can prove anything with statis-tics," said the manager of a big Indiana manufac-turing plant to the Board of Directors, "but when the statistics are on your own books you can believe them. And the figures show that since we installed electricity, seven years ago, electricity is the one item of costs that has steadily gone down."

The manager was arguing for an extended application of electricity in the plant-and he won his

point.

This manager's declaration as to power cost was fully in accord with the remark of Thomas A. Edison in the matter of lighting. "Electric light," said in the matter of lighting. "Electric light," said Mr. Edison, "is the only thing I know of that has become any cheaper in the last ten years."

Why has electricity declined in cost when indisputable figures and the common experience of men show that "the cost of living" has been steadily

rising?

It is plain that many of the commodities whose increase in cost is chiefly responsible for the increased cost of living enter into the production of electric light also—coal, labor, and copper for example. From 1902 to 1907 coal increased 6½ percent. Within the same time labor advanced 81/2 percent. The cost of copper increased about 35 percent. Yet the cost of electricity went down as steadily as the cost of living went up.

Mechanical factors have had much to do with this reduction. In the first place the more advantageous placing of electric plants beside water falls or coal mines. Then larger plants and great improvements in transmission systems have played a

part. Improved generating systems, as with the Curtis Turbine Engine, and the cheapening of installations by new inventions, have added in an important way to this progress in economy of use. Inthis progress in economy of use. vention and price as factors appear in the case of light, for instance, when the sharp decline in cost between 1892 and 1898 was due largely to the reduction in the price of carbon lamps. New types of lamps effected a further reduction between 1899 and 1902, and the perfecting of the Tungsten and later the Edison Mazda lamp, which uses only one third of the current required for the old-style lamps in common use, has again lowered the figures since 1908.

A fact of specific and striking interest is that all

classes of users of electric light and power have not only shared in the reduction but have helped to bring

it about.

This has happened under the natural conditions of extended use. The wider use of electric power and light has enabled distributing plants to sell current for a greater number of hours in the twentyfour and in this way to reduce rates based on the twenty-four hour maintenance of the plant.
Thus in Chicago one dollar now almost buys

eight times as much electric light as it did in 1886, more than twice as much as in 1909, just four years ago. Another illustration of progressive conditions as they are shown in large distributing centers is Boston's reduction of over sixty percent, in a single

The results of methods of use as well as method of supply—this is the story of the chart on this page.

And in all this growth of electricity from primitive experiment to world-wide usefulness, the General Electric Company has played a leading part. Just as electric lamps have been developed in the G-E factories for all uses from the lighting of automobiles to the lighting of factories-so numberless types and sizes of G-E motors are now available for driving all kinds of machines from dentists' drills to massive steel rolling mills.

To know how electricity may fit your particular

business, consult your local power and lighting company, or any G-E dealer or agent in your vicinity. No matter how simple or how complex your problem may be, these agents have always at their command not apply-information of the latest developments, but also the co-operation of any part of the G-E organization that may be most helpful to them and to you.



#### GENERAL ELECTRIC COMPANY

Atlanta, Ga
Baltumore Md
Birmingham, Ala
Boise, Idaho
Boston Mass
Buffalo, N Y
Butte, Mont
Charleston, W Va
Charlotte, N Ce

Largest Electrical Manufactures in the World cokuk, Iowa noxville, Tenn. os Angeles, Cal ousville, Ky

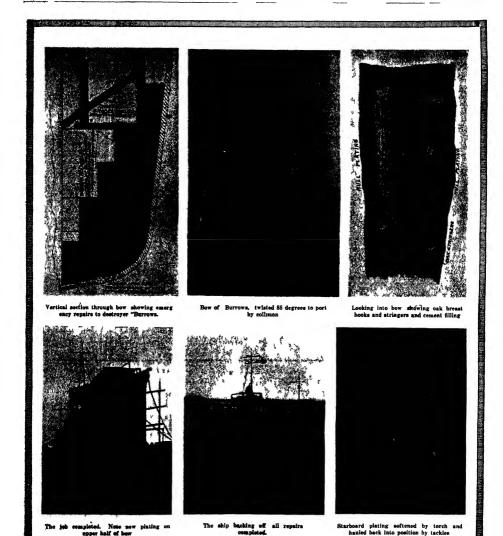
# SCENTIFICANTERICAN

### THE WEEKLY JOURNAL OF PRACTICAL INFORMATION

WARE CE. ]

NEW YORK, SEPTEMBER 6, 1913

16 CENTS A COPY



EMERGENCY REPAIRS BY BLUEJACKETS OF THE DESTROYER "BURROWS -- [See page 180]

# SCIENTIFIC AMERICAN

NEW YORK, SATURDAY, SEPTEMBER 6, 1913

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The Editor is always giad to receive for examination illustrated articles on subsects of timely interest. If the photographs are source, the articles Month of the articles Month of the carotic months will the receive special attention. Accepted articles will be paid for at require special section.

The purpose of this journal is to record accurately, simply, and interestingly, the world's progress in scientific knowledge and industrial achievement.

#### Commercial and Military Value of the Intracoastal Waterway

THE economies and milliory advantages to be sained by the construction of the system of intra-constant waterways which is recommended to Congress by Brigadier (denoral Bitky), the Chief of Engineers, U. S. A., are so many and valuable, that we believe Congress, after mature deliberation, will be convinced that the \$80,000,000 necessary for constructing a 12-foot waterway from New York to Beaufort, North Carolina, should be appropriated

As matters how stand, the constwise reaffic, whether by water or rail, to being carried effice by oven-colons ships using the outside deep-sea ronic, or by railway systems which are approximately parallel to the coasisips using the outside deep-sea ronic or by railway systems which are approximately parallel or the coasisips of the coasis of the coasis of the carried or an inter-coasisi waterway, it must be shown that a vertain portion—a sufficient portion—of this trailic can be carried as safely, more expeditiously, and at leaser cost by the proceed canal. The opponents of the cann claim that the carriage of freight can be done more economically under the present method by occur-going seam and sail vessels and occan-going larges under tow, and by the existing milways. As regarded the question of safe transid, the statistics of the mount losses of life and of ships and their cargoes in the coast-use trade prove that they are enormous and show no signs of dimination. To reduce those losses, canalysis we seeds are built more stoutly and at much larger cost than those which has interior water routes. Thus occan-going resolute out \$45.50 pc. ton, and the Misoshoph River tag with barges for 10,000 tons of freight, cost only \$12 per ton, Parthermore, the expenses of deep-sea carriage are becomes of the part of the market because of 4 per cent on vessels using lander routes of \$1000 to the control to seed to the delay due to wind and weather.

A review of these facts in the report of the Chief of Engineers, made he January, 1912, leads like to state that the advantages of metastion by interferor over outside routes are such as, in general, to justify the opening of interfor waterways, a conclusion with which we was in hoursy agreement.

the the question of the relative economy and conce of transportation by infand waters approximately parallel rajiways, it should be carefully noted that any deductions, drawn from previous experi euce, in which inland waterborne commerce hus de clined where it has come into competition with railways, are liable to be very mislending. the solley of the rullway to make discriminating rules ig the service by rail at poluts where comp tition with water routes was possible, and making in points which were not favored with water r pay the cost of such competition. The work of the erstate Commerce Commission and the prean enlightened public opinion are removing the burden of discrimination; and it is certain that if the Federal Government constructs the proposed intra constal waterway, it will see to it that the new route is effectively protected against any such burdensouse rate dis crimination.

The report of the Army Engineers draws attention to the facts that it has been a policy of the railway companies to obtain possession, as far as possible, of all available wharf space in terafinal cities, partly with a view to, presenting campellion; that the railways have thrown obtacles in the way of dividing a long-distance hand between rail and water, so as to make an all-rail curriage most advantageous. This has been done by plecing difficienties in the way of transfer between rail and water, by refusing to honor through bills of lading over a fixed rail-and-water route; by making charges for short hauls by rail and distribution from water terminate prohibitively high. If the fall benefits of improved waterways are to be obtained, belt the nation and the Nater must take such action as will insure rail cooperation between the companies operating by rail and by water. Nor must it be assumed that the opening of the intra-

Nor must it be assumed that the opening of the intracuents waterway will openine to the disadvantage of the milways. Experience gives reason to expect that liners will be a division of the freight based upon its character, the changer freight curried in bulk going to the water route, and the expensive freight onling for rapid carriage gravitating to the rallways.

rapid carrange gravitating to the ranways.

The results of rail and water competition in Europe, where the count and novignide river mileage is encount, shown that the one system be not indiminate to the toterests of the other. Thus, in Germany we find that the large system is not indiminate to the toterests of the other. Thus, in Germany we find the latter of the

On the question of the military value of the lattracustal waterway, the report of the Army Engineers robust to the well-cetablished principle that for the decise of a fortifer threatened by an attack from without at some unknown point, the forces for the defense should be concentrated within the frontier line, at some unknown point, the forces for the defense should be concentrated within the frontier line, at south from which they can move rapidly and safely to the actual point of attack when developed. The proposed waterway between New York and Norfoth is resolutional to the Army Englances to form a mod desirable line for such movements of troops, bying as it does for its entire distance under the shader of fortifications balli or planned for the defense of the coast. Furthermore, it is above, for the defense of the coast. Furthermore, it is above, for the defense of the coast. Furthermore, it is above, for the defense of the coast-live units will be multed in a single carrier; there are defined to the consideration by rail. Thus, larger administrative units will be multed in a single carrier; there are defined to the consideration of the coast-live and of the coast-live units will be multed in a single carrier; there are defined to the consideration of the coast-live and of the coast-live units will be multed in a greater freedom from ordinary delays of transit. For the transportation of a division of troops there would be required, by rail, for a division of froups by water would require the services of only 22 ellips of the size of the "Monume" of the

Southern Pueffie Company, which has a 16-foot draught. For mural purposes, the intra-constal universey presents the udvantage of an additional and protected entrance for each of the ports from New York to Narfolk included—an udvantage, says the report, which would make impossible an effective blockade of any one of those ports.

#### State vs. National Control of Public Forests

The well understood by those who closely follow the course of hegistation in Congress intel awa are excessionally intered on the trature books which shittensh they early the appearance below held which is concessed a positive senace to the materials within the concessed a positive mence to the public good. Of such a character, we do not head to the many in the quiet but fundamental satistics which is now at work in favor of transferring our public forces from national to State control. The arguments in favor of this tennifer are plausible, but specion—a. East which is well understood by the friends of forcestation, who are straining themselves to the utmost to prevent the passage of an act which would prove to be one of the most potent agencies in exploiting by private interests what is left to be medium for our materials forcests.

agreement asymptotic in the public of our national forests.

Although the issue is presented as one of State versus authoral control, it should be undarstood that the utiliante if not the present object of this movement is the substitution of private for public ownership. The surest protection and and private exploitation is to maintain the control of our forests in the hands of the Federal dovernment; for it is evident that the compiracy of an individual or of a collective body of men for the control of timber land would be more likely of success, if it were carried on in a State Legislature than in the halis of Congress itself.

trol of immer latte would be more likely of success, if it were carried on in a State Laglajature than in the halls of Congress itself.

The argument against State control is well stated in a recent jamphlet issued by the Oregon State Conservation Commission, and the reasons set forth conservation Commission, and the reasons set forth conservation Commission, and

ing from a State a large area of white is covered by forcet land has a special suphtable. The Commission starts out by laying down the bread proposetion that the National forests are the property of the aution at the National forests are the property of the aution and its argues that, if the nation is caulied upon on you take property outright to the State, then the backen is on the State to show how this great truet is to be administered so that those for whom it is granted will be lettle or even as well protected than they are now in their rights in and to it. Judged from a national standpoint, build the state of the property furnish immer and other timiler products. They have other functions and ness which extend fur beyond State lines and involve the welfare of many people extentor of the State, since they cover and protect the headwaters of streams used for naviantion, irritation and power, and to some extent unbinder distances from the protect the restrict of the conice and then have a beneficial effect which are just bounded by State lines. They retard soll creation and this have a beneficial effect which may be felt for hundreds and even indirectly for thousands of miles from the rection queved by the forests themselves.

miles from the region covered by the forests themselves
At present these national forests are under control of the Federal Government and the cost of their protection, about \$4,000,000 a year, is paid from the na-tional Treasury. In the State of Oregon atoms there is expended in this work about \$480,000 a year, an amount which is approximately one sixth as great as the State's total expenditures for all Governmental purposes this must be added the sums expended in actual fire fighting, which, in destructive sensors such as 1910 and mounted to from \$75,000 to \$112,000 additto Now the State of Oregon has recognized the value of this great asset and the consequent obligation impo and it has worked in the closest co-operation with Federal agencies and private owners. The people of Oregon take the collightened view that the State, to-day, is in a better position than if it owned the forests. As matters now stund the protection of the forests is paid for by the Federal Government and the State celves 35 per cent of the gross revenue. Moreover, the experimental work, studies as to use of timber, etc., from which the State receives the full benefit, are carried on by the Government. It is estimated that whenever a tree is felled and transformed into lumbs per cent of the receipts are left in the hands of labor per cent or the receipts are set in the mans of many and those furnishing the supplies. "It is to be assumed," the Commission asks, "that the State management will be more efficient, less expensive and more satisfactory than that of the Forest Service?"

#### New York the Leading Port of the World

T will be a matter of surprise, perimps, and certainty of some poissons, to the citizens of Nor York, to learn that the very latest estimates of the value of the exports and imports of the two distort that New York town stands at the fend of the 1st, with an utwantage of nearly two bundred million dollars over Landon. Our contemporary, the data in Nortice, realish us that New Yorks total of exports and imports, new valued at \$1.973. OSLOBO is over five these the amount of commercy what was curried on by the earlier country half a

As in the future, there is one dominant factor, the Pamanan Cand, which is bound to strengthen the lead now secured by this port, for the canal will bring New York 1,000 miles monrer to Yakobama than is Liverport, 2,500 miles morrer to Yakobama than is Liverport, 2,500 miles morrer to Yakobama than is Liverport, 2,500 miles morrer wellington, New Zerhand, and 2,574 miles morrer Valuration. New Zerhand, and 2,574 miles morrer Valuration. New Zerhand, and 2,574 miles morrer Valuration. The new conditions—the general re-arrangement of trade routes—will tend to strengthen the position of this port in this supermeety over its nearest competitor. Expressed in round militions, the returns in millions; Harabara, 1,674 millions; Harabara, 1,674 millions; Marselles, 478 millions; Marselles, 478 millions; Marselles, 478 millions; Marselles, 478 millions; Marselles, 470 millions; Marselles, 470

The Select Constant.—Means, C. G. Abbot, F. B. Fowle and L. B. Aldrich have issued in Astronomiscle Newtonian and Astronomiscle and the Astronomiscle and the Astronomiscle and Astronomiscle Astronomiscle and As

16 252 1

#### Engineering

The Languet Reisforced-Concrete Arch.—What will be the longuet arch in reinforced-noncrete is now being suits at Languets, Bettierdand, on the Chur-Aross Radiway. The arch will have 160 feet rise and a clear length between abuttonite of 330 feet. This will be the languet attructure of its kind in existence, being about two feet longer and 130 feet higher than the Risorgimento Arch over the Tiber at Room, Italy.

Test of Canal Gates at Miraflores.—On August 25th water was turned into the Miraflores looks to test the watertightness of the gries, which proved to be quite satisfactory. By the time this reaches our readers the last of the earth of Jees holding out the waters of the Paolite will be removed, and the tidal waters will extend through the canal to Miraflores. This section of the canal will then be in the completed condition, with the exception of a little finishing up by the drodges.

Even-may of Sterage Battery Railroad Cara.—The Prunsian State Railways, after an experience of many years in the use of storage-battery cars on their system, have found that, without making any radical changes in the standard railroad care, storage-battery propulsion may be applied unacceeduily in respect of both operation and economy. According to the Eleiracia Resize, the cost of operating the 200 cars of this type on these railways works out at only 1.75 cents per horse-power per hour.

To Build Up the Fleating Navy.—We are heartily in sympathy with Scoretary Daniels in his determination to band every effort toward brigging up our many affoat to its proper standard of strength. He is reported as stating that he will recommend to Congress that appropriations be devoted more completely than ever to the construction of battleship destroyers, subhnarine tenders and colliers. In order to compensate for the one battleship programme of the two preceding years the next appropriation should be for four battleships.

Memorial is the Late Sir William White.—We commend to the attention of those who are interested in nearly and nativelled matters the four that a meeting was recently held at the institution of Naval Architects. London, to establish a memorial to the late Sir William White. It was resolved to form a committee representing the naval and merchant services, as well as the engineering profession, in order to carry out the object in view. Promises of financial support will be received by the secretary of the Institution of Naval Architects, 3 Adelphi Terrace, London.

A Fostitinger Reduction-Gear Economy.—The Fost-tinger reduction-gear may be broadly described as a few decideding pump discharging into a water wheel, with regulating vance to determine the relative speed of rotation of the power and the driven shafts. In the celebrated tests made recently at the Vulcan Works. Hamburg, an efficiency of shout 10 per cent was secured. It is now proposed to add about 2 per cent to the officiency by utilizing the heat developed in the water of the reduction gear, for heating the feed water in its passage from the condensor to the buffer.

Steel Bulkheads Confine a Fire.—On the occasion of the last trip of the "Imporator" to New York, detective Insulation caused an authorsak of fire in a provision room in the after part of the ship, which served to prove the value of steel bulkheads in limiting the spread of fire. The watertight bulkheads below and at the waterline should find their counterpart in fire-proof bulkheads above the waterline. Our roaders will be interested to learn that the fire was automatically made known by the issuing of anoke from the Rich Marine Fire Detector on the bridge. This device received the first Scientific American medial for safety.

Chilled Iron Car Wheels the Best.—In a paper cod at the May meeting of the New England Railroad Club, Mr. A. A. Hale showed that, in the development of the freight car from 20,000 to 100,000 pounds capacity, all parts of the car have issen increased in weight, but no part has shown such slight increases as the chilled-iron wheel. Car capacity has increased 400 per cent, the weight of axia 140 per cent, the weight of axia 140 per cent, the wheel has increased only 38 per cent. In the opinion of the author, chilled-iron is the only metal of which whose a are manufactured which will stand up under extremely heavy loads without crushing or flowing.

Marine Diesei Engine Development.—Advocates of the application of the Diesel engine to large vessels, says Dr. Lt. Himshberg, in Poser, are endaworing to surb to a dagree the over-enthusiasm of radical supporters, who are prone to claim too much for this type of engine on account of the success of such vessels as the "Silandia". The short experience of arc batand with large oil engines on heard ships (while unineatly said short experience and owners), cashes specialistic oil difficult as yet; and the writer consistent that the prediction of street of the state of the sta

#### Science

General Michael Rykatchew, the veteran director of the Russian Meteorological Service, has just announced his retirement. He has been connected with the Central Physical Observatory (the headquarters of official meteorology in Russis) for 46 years.

Moving Pictures in Medicine.—Press reports tell of the invention of one Dr. Rosenthal, which was submitted for inspectuon at a meeting of the Physoutherapeuties Congress at Berlin last spring, which rendered it possible to make cinematographic views of internal organs to provide an illustration of the workings thereof and to facilitate the localizing of diseases. The invention is said to be an adaptation of the X-ray and is thought by some to promise great things in the way of diagnosis.

The Publications of the U. S. Department of Agriculture represent, in the aggregate, the most voluminous body of literature currently published by any scientific institution in the world. In order to meet the needs of scientific workers who now have difficulty in locating just the material they want in this great mass of publications, plans are on foot to establish an official research journal which will bring together all the results of important original investigations in the Department. Radical changes are also proposed in the plan of publication of the less technical literature of the Department, but the details of the changes have not yet been made public.

Ostwald's Assales.—Some twelve years ago Prof. Wilhem Ostwald founded the Annalen der Naturphilosophie, as an organ open for the discussion of those questions of philosophy which have arisen in late years through the very rapid growth of secentific knowledge. Prof. Ostwald himself has taken much interest in the development of questions relating to sociology, or to be quite exact, "Kulturphilosophie," as the German term has it. Our readers may result that one of the fundamental principles upon which tostwald bases he system of "Kulturphilosophie," is that all our doings must finally be aimed at increasing efficiency, or in other words, decreasing wasteful effort. In view of the prominent place which this particular branch of the decided to change the name of Ostwald's Annalen, which henceforth will appear as "Annalen der Naturnal Kulturphilosophie." At the same time Prof. R. Goldecheid has joined Prof. Ostwald upon the editorial staff of the Annalen. The sociological place of the work will be mainly in the hands of Prof. Goldeched.

Dried Yeast.—In the Bulletin of Agricultural Intelligence and Plant Diseases (Roms) Dr. F. Hayduck describes the remarkable development of the dried yeast industry in Germany during the passat produced intelligence of the Grant Development of the produced the second produced the passat produced the second produced produced produced the second produced p

Accology in the Arctic.—The plan of carrying on systematic upper-air observations with kites and balicons at stations surrounding the north point basin, in connection with the similar observations that are no be made by the Amundson and Stefansson polar expeditions, has now reached a definite stage of progress. An international commission has been organized to direct the undertaking, constiting of Gen. Rykstohew (president), Prof. Rergesel (secretary), Capt. Amundson, Capt. Ryder and Prof. Stupert, and a tentative programme has been drawn up. It is expected that stations will be in operation at the following points, and approbably others: Nova Eembla, northeastern Siberia, Spitchergen, northern Norway, Yakutak, Verkhoyansk, Iosland, Greevland (two stations), northern Labrador, Frans Josef Land (Reyer expedition which stated August 10th), northwestern Alaska (to be equabilished by the Carnegie Institution). It is recommended that all observations begin in the summer of 10th, the time of Amundsen's expected departure. Prof. Hergesell announces in this connection that the Germas scientific station in Spitaberges, which is ecompied chiefly with newtological investigations, will be maintained for at least the next three years.

. W. . . .

#### Automobile

Agricultural Tractor Trials in Germany.—By way of colorating the revolt of Prussis in 1813, the Königsberg Chamber of Agriculture is to hold a big agricultural exhibition with specal trials for monhanical plows operated by internal-combustion engines. The tests are to take place the end of May and the fixer of June and particulture can be obtained from the Königsberger Landwirtschaftskammer.

Maxim Silencer for Gas Engines.—In patent, No. 1,000,425, Hiram Percy Maxim of Hartford, Conn., presents a alencer for gas engines which comprises reversely directed, eccentrically arranged and nested series of wide cylindro-spiral shells formed to provide a series of alternately reversing spiral-which chambers which gradually oxpand radially from the admission end and gradually compand radially from the admission end and gradually contract toward a constructed discharge threat together with co-operating and supporting means which he utilizes in securing the deserved sincing offect.

Motor Trucks in Tripoli.—According to Information which appears in the Milan daily press, the Italian war department has been engaged in a series of very inter-cuting transle with power wagons in the Tripoli region, and these proved such a success that the army is going very largely into the use of power wagons in the near future, it benn desured to change over from here wagons as completely as possible in view of the many advantages aforded by the automobiles.

An automobile Improvement.—It is reported from Paris that the French authorities contemplate the adoption of a law or regulation making it obligatory to provide within an automobile some means whereby the comparate of the var, other than the chauffeur, can bring the ear to a step in case the chauffeur should become unconserous or otherwise disabled from handling the ear. Attention has been espocially called to the necessity of such an improvement by a recent accident in which a ear ran overbrard, when the chauffeur became unconscious, and resulted in the drovining of several children and other passengers of the ear. Doubtless the application of some means to prevent the operation of the safety devices except when absolutely necessary.

Camphor as a Vitalizing Agent. - Alroad, where great pride—and just pride—is taken in the milesge per gale in of fuel that can be entitained, a small band of motorists recently has been experimenting with gum compiner as "dope" for gasoline. Usually, about one ounce of camphor is piaced in five gallous of gasoline and it is stated by those who use the mixture that the operation of their motors is much superior with the camphor in the gasoline than without it. One motorist even goes so far as to claim that he has been able to increase his mileage per galion as much as 20 per cont, though it would seem that the increase cannot be due to the use of the camphor alone. The idea is not new, of course, for Curtiss, at present of acceptainer fame, used it as number of years ago in his racing motorsycles and it is said he sometimes uses it now in his accordance.

Rubber Tires and Automobiles Are Different Goods.—The Court of Appeals of the District of Columbia in Q. & J. Tim Company v. G. J. G. Motor Car Company has hed that rubber tires and automobiles do not constitute goods of the same descriptive properties within the meaning of the trade-mark las. The decision quotes a previous decision of the same Court in which Mr. Justice Robb, speaking for the Court, and "We think two trade-marks may be said to be appropriated to merchandiss of the same descriptive properties in the sease meant by the statute when the general and essential characteristics of the goods are the same. The rule that the goods must be identical would defeat the purpose of the statute and destroy the value of trade-marks. The test is whether there is such a sameness in the distinguishing characteristics of the goods as to be likely to milled the general public. If there is, only one mark should be registered."

Need for Standard Control. - What with new care counturally being hrought out and now models of old care periodically making their appearance, it would seem that it is a bundant come for standardization in the construction of routed units and particularly in the case of the parachitic tiver. At pression, for ozars are the same, and to make it even more difficult for the purchaser of a new model of the same make be already possesses, control methods often are altered radically. The Society of Automobile Engineers has made a laudable attempt to remedy the evil but it has not been altogether successful, probably owing to the fact that manufactures are loth to discard expensive jigs and tools in order to adopt a standard system. Still, a standard control method would be of material banefit to the owner for he would be able to drive his new car without preliminary instruction, regardless of how short the instruction might be, and what is even more to the point, he would be less likely to do the wrong thing, in driving a new car, from force of habit learned with the old one.



Bituminous surface maintained by one oil and three sand treatments annually

# Automobiles and Improved Roads

The Economics of Motor Traffic and of Highway Construction

By Logan Waller Page,

Director of the Office of Public Roads



Concrete construction. A well-built concrete ros nithough expensive, is cheaply maintained.

D'IRING the year 1912 automobiles paul in repeteration and license foce against preparents and license foce against of automobiles. From this country in 1908. In 1911 we exported automobiles to the value of sparts of automobiles. The curresponding flauer for 1912 was \$25,703,900. In 1912 we lead unterly as many automobiles in New York State as \$25,703,900. In 1912 we had userly as many automobiles in New York State as there were in France and Germany combined. The total number of machines upon our highways last year was a round million. There is evidence at every plane of automobilism in the l'inted States. What is the relation of this great movement to our highways.

We have approximately 222,000 miles of improved roads. This milenare includes not only instet-these highways, but a large milesage of grateded and straves natural soil roads. There is therefore the roads are not to the roads are to the result of the roads are not to the roads are not roads are n

We may expect, however, to find that our improved murdant roads are not withstanding the action of the automobile, and this is the case. Since the use of the automobile is increasing at an accelerated rate, and since, wherever a road is improved, it tends to draw increased traffic, we must avoid in the future the construction of water bound mecodem surfaces where heavy motor travel occurs. There are many places where such roads may be built with economy and confidence as to their service, but in the more deusely populated areas this is not true. The construction of bifurninous-bound mecodem surfaces were not such construction of bifurninous-bound mecodem country since 1966 is due almost entirely to the reaction of the automobile groun the old standard water-bound mecodem surfaces.

There has been an increase in the cost of highway construction, and repuir and maintenance. It does not follow, however, that this increase of highway costs in general is a relative increase jer unit of travel. The traffic over our highways in motor vehicles is in general as suttrey new and added liess of travel. Only in the last wo or these years now as demonstrated in the last wo or they went an are actionidate trucks ascum to replace horse-drawn vehicles for commercial purposes on the



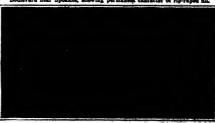
Traffic on clay gravel road (natural soil) near Fredericksburg, Virginia.



Laying brick for a road in Montgomery County, Maryland.



Boulevard near Spokane, showing permanent character of rip-raped fill.



Laying bituminous concrete, Hillaide Avenies, Januises, Ser Yes

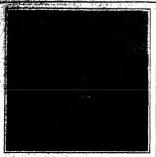
country roads. All hashing, until very recentily, has been done by borne-drawn vehicles. The pleasure vehicle drawn by horses has almost entirely disappeared in most sections of the country, and the automobile has not only replaced it numerically, but has multiplied the number of pleasure vehicles many times. Our insproved roads at present are sustaining, therefore, an amount of travel several times as great as they were ten years ago. The cost of our highways per unit of travel persons.

#### The High Cost of Waterbound Macadam Road.

We have not been building improved highways in this country very long. Before 1983, there was no systematic highway improvement. Not until recently have we been able to determine the cost over a period of years in this country of any of the standard types of roads. The water-bound macadam road was a more expensive road than was generally admitted. It was not customary to add the annual cost of periodic resurrishing to the annual cost of periodic resurrishing to the annual ministenance figures. When that is doub, it is found that the water-bound macadam road, 15 feet wide, costs appreximately \$500 per mile per year, or between five and six cents per square yard. The substitution of bituminous bound macadam aurfaces for water-bound surfaces, has increased the first cost of construction from 20 to 40 cents per square yard. It has apparently increased the cost of annual maintenance and, at present, we cannot say to what extent the annual cost of periodic resurfacing will be affected by bituminous construction. There are, however, a great many instances on record which indicate that the total up-keep of bituminous macadam roads will covered \$500 per mile per year, or

Neoro which induces that the tone one speece of bitminous macadam roads will exceed \$600 per year in the long ran. As we pease in review the various standard types of improved highway surfaces, we see that the cost of their maintenance and repair tends to increase with the cost of fart construction. This law, however, does not apparently hold for the most expensive roads such as well-built concrete, and brick roads, or bituminous with concrete foundation, the questions that is rapidly taking shape in the minds of highway employers in the minds of highway employers in the cost of annual repair and maintenance for a given period of years. Shall we greatly increase the cost of our road surfaces and avoid high annual charges for regarity and maintenance.

tonance During the sonson just closed, the United States Office of Public Roads has built a number of sections of experimental road at Chevy Chase, Maryland. These sections are of the highest types of road construction new favorus to highway send-neers. They include two sections where the product of the control of the c



Basschburg's apparatus to study a child's visual learning. This apparatus provides for a rhythmic successive learning of visual stimuli.

# Efficiency in Learning

A Practical Result of Experimental Pedagogy

By Dr. P. R. Radosavljevich New York University



Dynamometer and aesthesiometer by hich is studied a child's strength an after a period of mental or physical learning.

THE best way to show the dimensions and force of ental Pedagogy is to present its practical results. Like other great movements, experimental padagogy has overflowed the traditional channels of academic work and has become a new popular force. Its watchwords are: "Hydrone of Tecchiss" and "Boosnomy of Learning." ideas that the newer pedagogues are trying to attain with the least expenditure of gagace are trying to attain with the least expenditure of energy. In order that they may be attained the teacher (1) must be at home in his or her own school branch, (2) must know and practise the best way to present school material in the classroom, and (3) must show the pupils how to study most economically.

Saving the Energy of the Teacher and Pupil. Let us suppose that the first two conditions are ful filled. According to the ideals of the old pedagogy such

not satisfied with that klone. Experimental pedagogy asks the maximum from teachers, i. e., the most eco-homicsi way of learning or acquiring a school material explained and understood. Let me illustrate that by an actual experimental case.

A 8-year-old boy of average intelligence was asked, after certain preliminaries, to learn a poem with four after certain preliminaries, to learn a poem with four stances of six lines each, with the instruction to memorite such parts as quickly as possible, and to read aloud and recite aloud until enabled to execute one erroriess technicion. The experimenter, who had copies of the poem, designated the part which the child read by a vectical line on the right. So, for example, if he read four fixes twice, two vertical lines were drawn on the right; if next he reads two lines, a third vectical line of a largeth squal to the space occupied by two lines wis drawn. If we represent the lines of the poem by longituding the state of the poem by longituding these theorems in faiths t.

The latest the second of the poem of the poem by longituding these through the poem by longituding these through the poem by longituding the second in faiths t.

the parts already learned by going back occasionally e learning later parts (either to avoid them or in order to associate the parts with one another), that the first lines were repeated oftener than the last ones. and that the difficult parts (or words) were learned by means of special repetitions. This is the old, the usual, the uncontrolled, the unconomical method of learning, a memorizing left to accidental success and planless efforts. This is called "the part method,"

phaless efforts. This is caused "one pur meason," piece-meal," or "cumulative" or "practional" learning.

A week later the same boy was asked to learn a similar poem (both in quantity and quality) with the instruction to repeat it always from the beginning to the end until it was learned. The following graphic tation (Table 11.) shows the results

Here the same child needed only 15 repetitions, and his reproduction was more uniformly associated; he avoided too many or too few repetitions upon respec-tively easy or particularly difficult lines or verses. This method of learning is called "the whole method" or "the

method of tearning in caused "the booled method" or "the complete method."

Both the placement and complete tearning agree only in the fact that the child commits to memory in one stitled, i. e., a poem is learned in one day without interruption of time intervals between repetitions

A week still later the same pupil learned a similar poem, but in this case the child repeated the poem—by poea, but in this case the child repeated the poem—by the whole method—only once a day. The time of day was 9 A. M., the same as in the previous two experi-ments. The results are shown in Table III. Compared with the previous two methods this plan

Compared with the previous two methods this plan of learning proved still more economical; not) 8 repetitions were required. This method may be called distribution whose method. Its value has been demonstrated experimentally by Zoot, Menuman, Ebiblighaus, Magnoff, G. E. Müller, Pentschew, etc Zoot found that 2 repetitions on 12 successive days were better than 8 repetitions on 3 successive days. That this method is most economical and most natural is also proven by the fact that the Servian gustars (national proven by the ract that the servian passage (national folk singers) learn a national cpic or lyric song (sometimes 500 to 1.000 lines long) by distributive whole method only, i. e., by listening to the recitation of another yester. This method of learning is used also by the Greeks in committing to memory long Homeric

To ascertain the value of these three methods, the suits are tested after a certain time interval. I asked



A Salar Salar

same child to relears the same three poems after 28 days. All these experiments were carried out in Meumann's laboratory at Zürich. The results are shown

	Pirst Laurning	R	olograing		
Mesteri '	Number of repe- titions	After an interval of	Number repeti tions to relearn	Absolute	
Part method Whole method Distributive Whole method	1	Days 28 28 28	10 6	16	38 4 60 6 77 8

From this table it is seen that the percentage of saving in relearning is greatest in the distributive who method (77.8 per cent), less in the whole method (60 per cent), and least in the part method (384 per cent). These results were verilled also in a more homo-geneous material for learning, in so-called nonsonso syllables, e. g., lei, rit, fos, zam, ped, des, etc. These



syllables provide little attraction to the memory, cause they are almost devoid of associations, I. e., they neutral material in learning experiments. In mem origing such syllables my 28 subjects read them in a oraning such solutions of 2 superior variation in a regular succession, by means of a special apparatus. (see accompanying flustration). Of course, the words whose mountage are unknown, are memorized and rejeated with more or less difficulty for all manner of reasons, but the relative values of these three methods is the same as in the case of poe

#### The influence of Age.

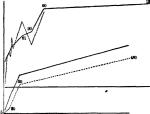
Age is another such secondary factor that the above mentioned boy needed 63 repetitions to commit to memory (by the whole method) a series of 12 nonsense syllables, and an adult (a university stu-dent, 22 years old) needed for the same series 13 repetitions only Consequently the popular opinion that children memorize more quickly than adults is erroncons. The child's superiority consists only in retentiveness, i. e., a child needs less repetitions to relearn material once memorized, but the number of repetitions required for learning the first time is greater for young children. In other words, adults surpassed children only when the work was prolonged, but children needed less repetitions in relearning

Another secondary factor is the time clapsed between first learning and relearning i found that the time saved in relearning decreased with age for all but the

The state of the s

5- and 20-minute intervals, as it is indicated in the fal-

	Per cent	of Forgett	ing for 97 sub	jects.
Relearning after	18 Adu	ilta	11 Child	iren
	Nomense Bylishies	Poems	Nonsense Syllables	Poema
6 minutes 20 minutes 1 bour 8 hours 1 day 2 days 6 days 6 days 7 days 7 days 14 days 21 days 30 days 7 days 120 days 6 days 7 days 120 days 120 days 120 days 120 days	2.5 11 4 20 3 52 0 31 1 39 1 50 7 50 7 50 0 97 2	0 0 3 9 21 7 41 9 3 88 2 43 5 48 5 5 48 76 1 76 0 52 4 76 1	8 H 14 6 22 7 37 0 28 3 31 0 42 4 46 1 49 5 66 2 94 3	1 7 5 5 17.9 35 3 20 7 28 2 



The curves below show forgetfulness during the day (after 6, 20 10) and 480 minutes; the curves shows show the forgetfulness after 1, 2 3, 4, 5, 6, 7, 14, 21, 30, 16, and 120 days In both cases the broken likes represent forgetfulness for peetry, and the continuous lines show forgetfulness for peetry, and the continuous lines show for settliness for mentinginess words. The children led association strength somewhal faster than the adults, the association strength at the end of one day was greater than at the end of 1 hours or at the end of 2 days.

Another factor is the child's general intelligence. bright child, on the whole, needs less repetitions than a dull one, but the lutter retains better.

The mental type of the learner counts also Although all my subjects experimented upon were of mixed mental (or ideational, monory) type, it was a great held to each to follow b a or her own predominant type of memory with which few seem to be familiar

#### How Rhythm Affects Memorizing.

Rhythm is one very important element in all kinds of learning; it forms an extra association between the varied stress it brings and the syllables so stress All learners are inclined to use rhythm and tempo, tre ing many at first and focusing later to a few; distinct injury is caused to the memory of anything once ac quired when it is relearned in a different rhythm. Of course the rhythm suitable to what is to be learned should be adhered to strictly. In learning lines of unconnected words and parts of a poem, Ebbinghaus found that a rate of 200 lambics per minute or 0.3 second for each measure is the most advantageous; and in learning the same lines 24 hours later, he also found that those lines had been better retained which originally were learned with greater speed. Meumanu and Pentschew found that, in general, for adults halfaloud learning (of nonsense syliables) is more favor children silent learning or that pressed voice

Practice has a great effect. I found that the num ber of repetitions necessary both to learn and to relearn diminishes with time, but the growth of practice is far greater in learning than in relearning. I found that a special practice in memorization improves mem-orization in general. This is also shown by the experiments of Meumann and Ebbert. I also found that there are distinct slow and fast types of learning, although the former may by practice approach to some extent the latter, so that the difference may be due to practice

#### The Will to Learn.

Of course in every method of learning the will to learn is essential. A striking instance for that is shown in my experiments. I gave a foreigner who understood no German a series of nonsense syllables. This subject not understanding the directions, read the syllables 46 times without committing to memory. When I asked him if he could repeat the series he exclaimed: "What i Am I to learn them off?" Then with 6 repetitions he

Meumann and Mayer tested the ability of school children to work alone or in company with others, and found, in general, that the work of pupils in groups (in

the class room) is superior to their work as individuals (working shape in the class room). Schmidt generally speaking, that the quality of the hom is interior to the school work.

Many have tried to show that learning is influence by the sex, correlational, diurnal, weekly, monthly, as asonai factors. But there are many crudities of seasonal factors. Int there are many crucicles of method and trivialities in the way of such results, because many people are attempting kinds of work in various fields for which they are totally incompetent. Of course every great movement floats many faddlsts. who are really irrelevant in the problem of economy of learning, this great postulate in modern school edu-

#### Emergency Repairs to a Destroyer

#### By J. F. Hellweg, Lieutenant Commander U. S. N.

DURING the last winter's maneuvers of the Atlantic Fleet off Quantanamo Bay, Cuba, two of the destroyers collided about twenty-five miles off shore. The "Burrows'" low was twisted to port about eight; degrees and was budly crushed, as shown in one of the front-page photographs

This injury, while not endangering the safety of the ship, effectively prevented the "Burrows" taking any further part in the fleet maneuvers. Had such an ut occurred during wartime, the ship could not have been operated and, had she been chased, she could not have escaped, as her speed was practically killed. A destroyer in such condition would sadly haudicap and the fleet, since she would require protection and could only make about six knots

White returning to Guantanamo Bay, plans were out-lined for repairing the bow and were submitted to the Flotilia Communder shortly after our arrival in p

The next morning the ship was placed alongside the dock on one of the numerous cays in Guantanamo Bay, all weights, including auchors, chains, ammunition, fuel oil, fresh water, stores, etc., were shifted aft, and the cutting out of the rivers on the stem was commence

We knew that the ship's keel was broken short off about two feet abaft of the scarf of the keel and stem; but the ship's weights were not sufficient to raise the bow so that the break could be reached. A large and was therefore lauded on the stern to lift the bow. The ship was then run inshore till the forefoot took on the cradle of a small marine railway used for repairing launches, small tugs and barges, the ship being steadled by large barges on both sides. By this means, w was placed in water about four feet deep at low tide.

To permit the use of air tools a small air this was phed from the ship's air compre was rigged with three ontiets. Air tools were borrowed from the fleet, and the men were arranged in to push the work as rapidly as possible.

Scaffolding was built around the bow with targetruft material, and the ship's searchight was dismounted, taken on the beach and mounted so that the light

could be thrown on the work.

Men from the U.S. S. "Dixle" and the U.S. S. "Monaghan" helped the crew of the "Burrows" through-out the repairs. As the keel had been broken short off out the repairs. As the seen man been conven short on about two feet about the scarf of the stem, the latter was all clear for removal as soon as the rivels had been cut out of the side plating. The stem was dropped oard and hauled up on the beach, where it was straightened. Owing to the lack of facilities, the stem had to be heated and straightened in spots, the twists being gradually worked out of the stem. This straightening, under the existing circumstance ample of what an American bluelacket can do with little or no facilities or tools at hand.

The port plating was so badly twisted and torn that

none could be saved. The starboard plating was heated by a large blow torch and incled back into place by tackles. Some of the upper plating on this side had to be renewed. The ship's frames were so 'adly crushed that they were thrown away.

After the straightened stem was swung into place,

it projected about eighteen inches above the lev the deck, this being due to the latter's having been pulled down at a sharp angle when the stem was twisted and the keel broken

et and the Kee broases.

It was impossible, at first, to raise the deck; but, by sitting the huiged plating close up to the deck on both bows, the forecastle deck was jacked up into place and the stem bolted in position. The starboard plating was riveted in place and the port plating was then built up by sections.

The broken parts of the keel were chipped off flush

butted together, and then secured by a shoe of %inch botter tron and eight through boils, as shown in sketch. The discarded ship's frames were replaced by oak stringers and breast-houls. These were put in position, wedged apart anug against the skin of the si and secured in place with through bolts as shown in the sketch. Cement was poured in through the filling

ak stringers and breast hooks were alternated in building up the bow.

2.33

huliding up the bow.

In ninety-one working being the flow mar bonn and trivily cut off and rebuilt. The ship was intent to Hospital Cay at 10 A. M., March 7th, 1913, and backed preself off at 1 P. M. March 14th, 1918, ready to take

hereset on at 1 t. As. mercus area, acas, respect to new her place in the fleet and ray at any speed. Inquiries have been made, and this appears to be the first time in our Navy that such a job was ever undertaken by a ship's company. The crew averaged thirteen hours a day in repairing the bow, some of the men working in water halfway between their water and shoulders for hours at a time. With the assistance of the searchlight, the work was pushed till a late hour every night, when it was possible, and the sn and cheeriniues of the men was such as to make one proud of the American bluejacket.

During the maneuvers the day following the completion of repairs, the "Burrows" ran at high spe a good sea with no trouble. A month later she entered the quarterly full-speed race and maintained her previous position as the fast boat.

The American public never hears how the young Americans who serve their country in the Navy rise to any situation, and perform unexpected duties quietly and efficiently without thanks or commendation—duties which, in wartime, would attract the attention of ever e United States and win for them the thanks of their fellow countrymen

#### A Railway in Iceland

A T present methods of travel in Iceland are of the most primitive description; a few carriage roads exist in the south, with bridges over the rivers, but generally throughout the island journeys are made on increciació, over bridie-paths or no paths at all, and streams have to be forded. A few years ago the Althing (national assembly) voted funds for surveying the route of a railway from the capital, Reykjavik, in an easterly direction through a comparatively populous and thriving region, and one much frequented by tourbets. Plans are now complete for this line, which will run from the capital over the Thingvalla plats to the Offusa bridge, a distance of about fifty-sight miles. The estimated cost of construction is \$1,000,000. Ultimately it is proposed to extend the line to Thorsian. with two branches from that point, one leading to the geysers, and the other to Oerbak. The railway project keysers, and the other to occusion. The Fairway project has led to ambitious plans of drainage and irrigation along the proposed route, opening up extensive pasture lands and enlarging the already important dairy industry of the country. To the tourist the railway will offer an agreeable substitute for the present tedious ourney by pony to the geysers, Mount Hecia, and other

#### Hawker's Failure to Win the Daily Mail Prize

HARRY A. HAWKER, the solitary entrant for the Duily Mail prize of \$25,000, offered for a flight in A nutly Mail prize of \$25,000, offered for a flight in a hydronerophuse around the coast of Eugland and Sectional, came to grief 15 miles north of Dublin on August 27th. He had then covered 1,043 miles of the total of 1,550. At Obstrone of the floats of the mechine had to be repaired. Engine trouble brought Hawker down of Arghibaltica. After crowding the sea to Larne, further adjustments of the engine consumed an hour and a built. He accorded neaths of the contract the contract of the season of the contract of the season of the and a half. He ascended again and flew stead two hours and a quarter, when, curiously enough, the siliping of his rubber-soled boot caused him to lose siliping of his rubber-soled boot caused him to lose control of his machine, so that he plunged into the water from a height of fifty feet, near the shore. Hawker was only bruised, but his mechanic's arm was broken. The machine was hopelessly wrecked, It is said that the Daily Mail will present £1,000 to Hawker in recognition of his brave attempt

#### The Current Supplement

In this week's Issue of our Superlement Prof. E. L. Schwarz contributes an article on new types of volcances in Iceland.—The production of synthetic tandard and many house to appet the production of synthetic tandard and ning is reported, and may prove of considerable interest to the leather industry.—E. J. D. Coxe gives us an illustrated description of Open Air Coal Mining as carnuarrated description of Open Air Cool Mining as car-ried out in Pennyiyania.—W. A. Nicholson contributes an article on bird calling, which is illustrated with pictures of different forms of whates used to imitate birdcalls—The second installment of Lieutenant Col-onic Kuluis article "Some Aspects of the Subject of Transportation" deals with traffic by water.—John C. Parker wittes on the industration er writes on the industrial use of synchrone tors by central stations.--Prof. E. E. Barnard puts on record for future observers the present appearance of some temporary stars.—Charles Kassel contributes in article on Heredity and Gentus.—The views, ofttimes article on Herenty and Gentus.—The views, outcome qualit, held by prominent thinkers of the past and present regarding the seat of the soul, are reviewed by Dr. D. F. Harris.—An important discussion on life-sources of motor fuel held at the nightist flower Trans-portation Conference, is rejected in this issue. 

## Patents and Modern Industrial Conditions

#### The Stimulus of Patent Protection

By Frederick P. Fish

I REPRESENCE has demonstrated that so form of re-levant so fitted the enthancement, was so productive of advantage to the community and was actended by so fav disadvantagies as the grant to an inventor of a monopoly of his development on the limited time. While many other forms of several have been suggested (such suggestions were inside at the convention which adopted our maweek make at the convenion warm samped our in-tional constitution), they have nowhere seen adopted as past of the machinery of society. Everywhere some form of exclusive control for a limited time has been recognised as the best way of dealing with the matter.

The encouragement of patent protection does not alone stimulate the inventor to intellectual effort; it excites to strenuous effort a long line of intermediaries capitalists, investors, husiness administrators, diceneces and users who work with or under the patent and whose eration is vitally necessary that the invention may not be confined to a paper description, but may

actually get into use.

After all this line of public servants has been rewarded, the uitimate consumers get their advantage from the invention, even during the term of the patent, in the form of less cost, added facilities, increased comfort and greater convenience; and their gain, while the patent is in force, is undoubtedly in almost every case infinitely greater than that of those who profit directly from working under the patent. Of course, when the patent expires the invention is free to all.

Until 1888 Switzerland had no patent law. It was argued that, situated as Switzerland was, in the heart of the industrial world, with a docile and intelligent population, trained by an admirable system of educa-tion, and with the great advantages by way of watertion, and with the great advantages by way of water-power which the country possessed, it could progress more rapidly if its citizens were all free to appropriate for the national industries the ideas, patented or un-patented, of the rest of the world, without the grant of any monopoly to individuals in Switzerland itself. This policy was, however, found to be short-sighted and illadvised. The Swiss were not encouraged to invent. More than that, they were not encouraged to adopt and introduce inventions. They did not develop the desire to improve. Because they had no patent system, their industries did not advance satisfactorily.

Under the stress of the necessity that inventions should be fostered in the community, if industrial progress in competition with that in patent-granting c tries was to be secured, a patent law was adopted in 1888. Since then there have been over fifty thousand patents issued in Switzerland and her industrial pro

gress has been marked.

Holland in 1863, before the extraordinary expansion of the latter part of the last century had even begun sholished her patent law, undoubtedly influenced by the hope that her situation was such as to make it more for interest to take freely the inventions made any where outside of her own boundaries than to attempt to develop inventions and the inventive habit among her own people. It is significant, however, that she has, ufter trying the experiment for more than a generation, recognized its futility and has now again established a patent system.

Inventors Helpless Without Patents.

Nowhere can it be worth while to invent, unless there

is opportunity for utilizing inventions if made every citizen were an Edison, it would not profit him to work out new ideas on paper or in a laboratory un-less the conditions were such that they could be intro duced into use with the chance of a proper return. inventor therefore is helpless unless he has something to offer the manufacturer or the capitalist that will justify the latter in paying for rights to the invention. An adequate patent system gives to the inventor, who as a rule never could himself do anything with his inventon, something that is taughbe and of value, which he can transfer, in whole or in part, to the business enterprises which alone can make the inventors. tion of value to the community. Inventors, and business men who develop inventions and introduce them to ness men who develop inventions and introduce them to the service of man, to exactly the same degree and for the same rasson are stimulated by the protection affort-ed by a patent, to efforts which they would never other-wise make. Each class would be helpiese without the other. It is only when both are encouraged and pro-tected, as they are by the grant of a patent, that the rectors, as two are yet res grants or, a protest, can be promptes of the merhal arts in prometed. Even if the invention master is mad demand, there is frequently the opportunity and command, there is frequently the opportunity and command or the expenditure of a vac-niture of the part of these who are introducing it into me. Account of the part of these who are introducing it into me.

always there is the chance of utter failure.

Under these circumstances, neither in Switzerland or Holland, nor elsewhere, could capital be expected to take up and push new inventions under condi where, if success were achieved, the full benefit of the invention would necessarily be immediately shared by all competitors.

ct, competitors would have a great advantage over the manufacturer or the capitalist who bore the brunt of the preliminary development. They would have borne no part of his burdens and expense, but would, without cost, adopt from him the perfected thing to which he had devoted so much energy and in which he had made such a large investment. They would reap where he had sown Under such conditions even the most brilliant inventor council get the help which he must have.

The effect of a sound patent system is to overcome these obstacles to the development of inventions, to succurage men to invent who would otherwise have very little reason for inventing, and to attract business men to the arduous task of perfecting and introducing inventions when otherwise they would be in-clined to leave them severely alone.

Superiority of American Patent System.

The standards and rules imposed by foreign paten laws as to working inventions, and as to the grant of ory licenses, are and must be purely arbitrary. Even if wrong in principle they may operate reason inventions But in so far us one operate they are fatally destructive in many cases and no man who is inclined to invent or to proon can be sure that any particular invention will not be one of a class that is necessarily ren-dered unprofitable because the law falls to give him a free field for effort during the term of the patent.

ter a somewhat careful investigation of the situa tion in foreign countries, I am satisfied that the so-called es and computatory license clauses of for eign patent laws are hostile to the real public interest and that they operate greatly to the discouragement of invention and thereby distinctly stand in the way of the sound development of the useful arts. I believe that the simple provision of the United States patent iaw that after the grant of his patent the patent owner shall control the invention absolutely for a short but definite term, having no more payments to make and no fear of interference from competitors, during the term, gives to our people a far greater stimulus to invention than does the law of any other country. The result is that to-day there are not only a very

large number of men struggling with inventive prob-lems or who are on the lookout for the opportunity to invent, but the effort has been systematized to a large extent in accordance with the scientistic principles upon which modern business is carried on. With the large enterprises of the country, inves much a part of the systematic organization of the business as manufacturing or selling. Intelligent men are employed to determine the problems of the business and to find in what direction improvements should be made that there may be extension into new fields. In creased production, greater economy, or an improved product. Highly trained engineers and inventors attack the problems as they are presented and work then out in well-equipped laboratories where not only tech nical skill, but thorough scientific investigation, ried on almost regardless of expense, are appli their solution. Meantime, as always, individuals, even ost humble, are inventing or hoping to h They know that nothing is more likely to advance them I wealth and comfort than an invention, the oppor-tunity for which is wide-open before them, reward in proportion to the merit of what they may accomplish, being almost more certain than in any other field of human endeavor.

Patent System Imperative Under Present Unstable

Conditions.

Continued and incressant industrial improvement is essential to our well-being. In the practical arts there is no such thing as a stable condition that can be relied upon as permanently satisfactory. Unflagging in-

iled upon as permanently setfashedory. Unflagging lineution is required at every stage of progress.

Up to a recent time our sétuation in all respects has been such as to pruncte Sachastrial Gevelopeent. We have had as a background for it an ecommons amount of free land which was open to cultivation. This has now been practically arthousted. This circumstance affects our industrial sétuation disadvantapound; but it had to come. We must use every weapon to neutralise the loss of this asset.

The prevailing popular sentiment of to-day and the new laws and new interpretation of old laws based upon that sentiment are such as to require a definite readjustment of business and of business methods in all their relations. But the process of readjustment will surely be one of shock to our industries. They will endure, even if they could never have grown to their present proportions had the ideas of to-day prevalled fifty years ugo. It is, however, clearly a time in which we should hold on to any feature of our social organization that is right

Foreign competition is sure to be more serious every ear. To-day, except for the artificial protection of turiff laws, the whole world, because of improvements In transportation facilities due to invention, is in immediate competition. No industry one torive in any country unless that country has peculiar advantages, either matural or acquired, so as to be able to produce at such low cost as to meet the competition of other countries. The natural advantages of the United States are great in some directions, but are by no means controlling as to many of the industries. competition with foreigners we are hampered in many ways. In our cost of production we are embarrased by the high cost of our labor us compared with other countries. We have lu the past more than held our own in International competition, partly because we have surpassed all other countries in shop and business organization, but chiefly because of our superiority as Inventors and in the quick and comprehensive adop-tion of inventions. If the process of continuous im-provement is checked, we shall lose this advantage and there will be no alternative except the destruction of some or many of our most important industries or a reduction in the wages and standard of living of our workmen.

The opportunity for improvement nts based upon luven tion is in many branches of industry growing less There is no longer room for the striking advances in agricultural machinery, muchinery for making fabrics and shoes, electrical and other power apparatus, machinery employed in the production and working of wood and metals and in other great departments of ludustry that there was a few years ago. It may almost be said that many of the arts are already developed almost to the point of saturation. It is not so easy as it was to find out how they can be improved There should be every possible and to improve them incentive to seek out and to develop an incessor series of minor improvements which may in the aggrega ford great possibilities of advancement. The latter are of a kind that especially requires encouragement, for they do not ground appeal to the imagination and the direct returns from anyone of them are not likely to be large. They are not often developed as the re-sult of a lappy thought. Close and careful study and utific effort carried on persistently, systematic and at great expense is generally required for them. Agriculture and the production of food products may be revolutionized during the coming century by chemical inventions. In other fields there is room for many great and important improvements, which cannot be realized unless our putent system affords the requisite encouragement

More than ever, when there are causes at work which depress entitusiasm and indi back development.

The Oldfield Bill that has been reported by the Committee on Patents to the House of Representatives at Washington is a most serious attack mean our patent

Any provision in the law preventing the imposition of conditions as part of a sale or license of a intented article or of the contract authorizing its manufacture or use, or any requirement that would impose a penalty if the invention was not manufactured, and particularly any requirement by which under any circumstances a license to use the invention could have been acquired for the asking by a person or corporation to whom the patent owner did not wish to grant a license would undonlitedly have checked invention and the develop ment of inventions to a marked degree. The testi-mony before the Oldfild Committee of those familiar with the subject is practically unanimous on this point And yet it is just such an inroad upon the established law of the land that characterizes the Oldfield Rill

The community as a whole, requires for its prospe ity an adequate patent system. I believe that ours is adequate, that it would be a national if it were weakened as proposed by the Oldfield Bli.—
Address delivered September 2nd, 1913, before the
American Bar Association, Montreal, Canada,



Cutter head of hydraulic dredge, show-

# St. Lawrence Ship Channel Improvements

Constructing a 35-foot Channel Between Montreal and Quebec

By Harry Chapin Plummer



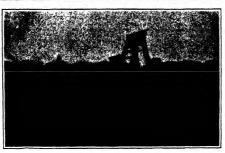
Stone lifter raising boulders at Cape Charles.

WHEN the season of navigation on W the St. Lawrence River closed last tween the Traverse, at the eastern end of tween the Traverse, at the emercia and of the Isle d'Orlents, below Quebec, and Montreul, a contracted distance of 220 miles, was half completed, at a total cost of close upon \$15,000,000. As showing the determination with which the great task is being prosecuted by the Canadian Ministry of Murine and Fisheries, it need only be cited that, having accomplished the opening of a 30-foot channel for 60 60 statute miles, of a total mileage of 63 35 between Montreni and Cap à la Roche, and the deepening of the Beauleu and St. Thomas channels, below Quebec, to a depth of 30 feet at extreme low tide, work being rushed upon a 35-foot channel, also between Montreal and Quebec, u distance of 6.97 miles of which is now completed Inkewise, a good start has been effected upon the north channel below Quebec, which it has been decided to deepen to 85 feet at extreme low tide. The south channel below Quebec has already been deepened to 30 feet and opened to navigation. From 1851, when the first real attempts were begun upon the improvement, to March 31 of the present year, the sum of \$14,524,555.51 was expended and the num-ber of cubic yards dredged totaled 78,-

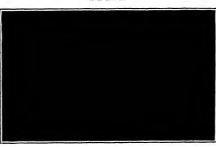
It is tigured that the average load-line of fifty modern vessels is more than thirty feet, and one authority holds that there are only two, or at most three, ports in the world accessible to them. One of these, of course, is New York. The situation of the St Lawrence ports of Montreal, Quebec, and Three Rivers is regarded by the Cauadian authorities as decidedly advantageous, even though the thirty fect may ut no distant time be deemed medlocre. The new improvedeemed medlocre. The new improve-ment, doing away with the probability of delay and accident to ocean shipping, mu greatly advance the position of the thre ports, and further improvements to the St. Lawrence River, to give any reason able depth by dredging, must, as a result of the work now progressing, prove to be not only feasible, but obtainable at much smaller cost than for many rival ports, and it will require virtually a nominal cost for maintenance. At the present time a fine channel of thirty feet at extreme low water, has been accomplished between Montreal and Cap à la Roche, while similar depth is to be had between the latter point and Quebec by taking advantage of the tide. It is estimated that the low-tide channel will be completed us far east as Quebec before the end of another year.

The completed channel has a minimum width, in the straight portions, of 400 feet, and on the curves, of from 500 to 800 feet. The channel does not afford the usual difficulties of canal navigation. There is sufficient water on the banks to minimize induced currents, which, when the cross section of the passing ship is large, in proportion to the cross section of the channel, render safe steering at ordinary speed difficult.

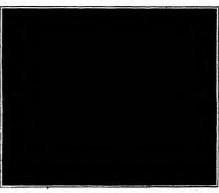
The success of the work is in great measure due to the geographical situa-



Stone lifter with grips capable of bringing up 50-ton boulders from the



Shale rock, dredged without the aid of explosives at Cape Charles.



Section of discharge pipe, showing ball spreaket spring joint between each length of one hundred feet.

tion of the route, to the physical features of the river favorable for improvement, to the determination and public spirit to the determination and public spirit of the business men and industrial corporations of Montreal, and to the recognition by the government of Canada of the national character of the project. Yet an other factor which has contributed to success is that the ship channel elevator dredges employed in the work, which have earned for themselves a wide reputation, have all been designed and built at the government shippard at 1 Sorel, on the south bank of the St. Lawrence, between Montreal and Three litters. Their construction has not been competitive, nor yet cheap; only the beet material has been used, and the most careful workmanship. The dredges are both massive and strong, with a resulting capacity of 6,000,000 yards per a nunum, much of which has been put to test in exceedingly hard material. Because of the fact that the St. Lawrence.

River has its real source in the Great Lakes, it is probable that there is no river in the world so well adapted for improvement. The usual condition of a river presents steep slopes at the source, which erode the banks and transport which erode the banks and transport coarse material. This, as the slope becomes more gradual, decreases, until at the mouth of the stream the water carries in suspension a fine sediment, which deposits to the great detriment of navigation Such has been the geological and geodetic history, for instance, of the Hudson and the Mississippi. In the St. Lawrence the material from most of sources of supply is all deposited in the settling basins, the Great Lakes, and from there to the ocean the bottom of the river is usually hard, so that not only is the water clear, but the bed is permanent, and except for floods during the ice ac-cumulations, the fluctuations in level are gradual, and not excessive.

In the ship channel the material to be excavated varies from soft bine clay, into which a pole may be planted some six or seven feet by hand, to stiff clay, to hardpan as hard as a macedamised road, and to shale rock and large boulders. In one or two localities coarse sand is found, at which points dredging has to some extent to be repeated.

The dredging operations undertaken in the course of the improvement do not either theoretically to practically lower the level of the water. No material is removed; it is merely taken from one piace and deposited in another. So long as the water supply remains the same, the same level may be relied upon. The nature of the material composing the bottom of the river, although in many places very difficult to dredge, is, for the same reason, of such a character that a dredge cut, one made, is substantially permanent.

The currents of the St. Lewrence are, for a river of such size, not only reasonable and regular, but altogether free from the usual dangers to navigation resulting from freshes. The winter season, with its los and anow, is the one great drawback to the St. Lawrence. The successful work accomplished by the ice-breakers during the last two years, however, proven

that the navigation season may be materially length

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CONTRACTOR OF THE STATE OF THE

rthy feature of the work is that it has be A sistemental Seature of the work is that it has been groupointed in a more or loss swift current and without interruption to the almost constant navigation ratio of the irrer. The dredges are operated, during the season, 125 hours per week, or steadily from midnight on Stunday until noon on Saturday. Only two holidays on Denninch Day and Labor Day—are observed. Stops are made only for had weather, for repairs, for shift-in-increase a phase to aparther or to allow room for are gaded only for not weather, for repairs, for shifting frows one place to another or to allow room for passing craft. Coal is supplied by barges without stopping the work. The steady work at a depth of from \$2 to \$9 feet in very hard material, which is increasing in the resistance as progress is made toward Quebec, and is very taxing on the machinery and equipment. Only a well designed and strongly constructed plant could stand the strain. A dredge capable of re-moving 6,000 yards per day of soft material undergoes a relatively greater strain by the dredging of 1,000
yards of hard-pan, in which boulders are embedded.
A notable increase in the expenditure for operations of late years has been due to the advanced cost of supplies and repairs, wage raises and the greater cost of dredging in hard bottom.

About four hundred men are employed in connection e dredging operations, all of whom are sailors, born and brought up at Soret or at some of the parishes bordering on the river. Most of them have been trained to the service from boyhood. The senior captain of the fleet is credited with the statement the This training of the labor employed has undoubtedly been a factor in the orderly and successful accomplishment of the task, which requires extraordinary care and skill and indomitable patience, the machinery being which necessitates frequent raising and lowering of the steel bar. This is done by the aid of a winch on the scow, the steam for which is obtained from the steamer by means of a flexible steam hose.

"If an obstruction is found while testing, its position is fixed by simultaneous sextant angles taken by two engineers who stand on the bridge of the scow over the suspended roller. These angles are plotted on a chart with a station pointer, so that when the sweeping is finished in one locality, the positions of obstructions, if any, are located and shown on the chart. It is then an easy matter to have these removed by a dredge or stone-lifter, as the case may be.

"The extent of this work may be inferred from the fact that where the channel is 300 feet wide, eight lines are required to be run, and where the channel is wider, it takes from eleven to fifteen lines, and up to

"At the beginning of the season it is usual to run of testing from Montreal to Batiscan through the dredged channel, and afterward the channel is tested more thoroughly The work below Batiscan, in-cluding Cap à la Roche, where the current is strong, and the weather frequently stormy, is usually postpon until about mid-summer Before the work belo Quebec was commenced, one sweeping plant was sufficient, but at present two outfits are kept busy covering the ground required to be tested."

#### Danger from Fire in Steel Shavings

FACTORIES and machine shops which produce large quantities of steel shavings from their lathes may take heed from a lesson recently taught at a large dynamo factory in Plainfield, N. J. In the yard of this factory the steel chips are piled up until there is a sufficient quantity to make a carload.

of motor vehicle operated by steam. The turbine is located under the body of the car. It runs at a normal speed of from 3,000 to 4,000 revolutions per minute, and is geared by means of a terring-hone gear set to the hydrautic transmission which runs at about 600 revolutions per minute.

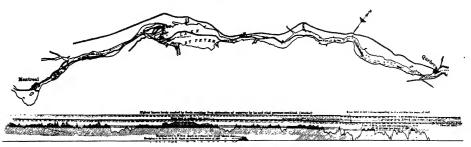
The car is of the single truck type, having only four wheels and all four of these are used for transmitting power. That is, tower is transmitted from the oil pump to the two axles through two oil motors. The turbine will develop more than 25 brake horse-power, which is considered high for this type and size of

Since no oil is introduced in the water which pas to the turidne as steam, it may be used over and over. In order to accomplish this the exhaust steam with be conducted through a series of covered copper pipes conducted through a series of covered copper pipes located on the top of the car. The steam with the con-densed in these pipes and will then return to a reser-voir from whence it may be introduced into the boiler when the water line falls betow normal.

The car witt be tighted by means of Blau gas, which wilt also be emptoyed for vaporizing the fuel under the boiter. In cold weather it is proposed to heat the car by menus of surplus steam from the botter. hydrautic transmission is the same as that used on ne make of molor truck, and is employed in this case in preference to the spur gear speed change.

#### A Giant Aeroplane

THE St. Petersburg correspondent of the Parislan sporting journal Acro telegraphs to his paper that Igor Sikorsky, a student at the technical high school of St. Petersburg, has built what is probably the biggest aeropiane which has thus far anneared Sikorsky's machine is a biplane, the upper surface of which is some



Map and profile showing St. Lawrence ship channel improvements.

forced to the utmost, and passing vessels having constantly to be watched for

As a portion of the channel is finished, it is thoroughly swept with the testing-scow, and if it is proved clear it is immediately opened for navigation. The problem of thoroughly sweeping the channel is one of great importance and considerable difficulty, good weather conditions being an absolute essential. V. F. W. Forneret, the superintending engineer in charge of the project, with headquarters at Ottawa, thus deof the project, with he scribed this feature of the work for the Scientific AMERICAN:

"Although, with the exception of some m Champtain, there is practically no filling in, and although, since the commencement of the ship channe although, since the commencement of the sain channes project no actual boulders have been known to be car-ried into the dredge channel, such conditions being possible, it has been decided that once a year the dredged and shallow channels shall be swept. A twinr and a testing-scow make up a sweeping plant. When this is in operation the bow of the stee er fits into a 'V' shaped groove in the stern of the testing soow, which is securely fastened to the means of strong wire ropes, one on either side, so that the scow is propelled and steered by the steamer. "A steel roller, 40 feet iong by one foot in diameter

a steel roller, so rect long by one root in diameter and weighting about two and a half toos, is suspended under the scow to the required depth, and this sweeps the channel against the current, running a sufficient number of parallel lines to overlap such other, so as to cover the whole ground.

"Formy or smoky weather, due to forest fires, will pt the work, because the shore marks cann interrupt the work because the shure marks cannot or seen for guidance in running the parallel lines. The work has to be stopped also during rough weather. As the work of testing is always done in the channel, a great deal of difficulty and interruption is caused by

neing vessels. . "In think water the dapth is constantly changing.

Sa Grand St. Control of the Control

While a large pile of these chips was waiting for a car to take it away work en set fire to some rub bish near by. This heated the steel and soon there was plainly visible a column of smoke issuing from the pile. A one-inch stream of water was played on the steel for several hours without baving any other than to produce a small but lively volcano cause by steam from the water Then the city fire department was called and after a heavy stream of water was played upon the steel it was thought to be extinguished.

However, the next morning the pile was smoking and faming as vigorously as before and it was necessary to rake the shavings apart before the flames could be subdued. Since all steel chips from this factory are put through a centrifugal oil separator on coming from the machines, oil was not the cause of the spontaneous combustion. The fire was obviously started on account of oxidation taking place faster than the resulting heat ild be conducted away from the steel which was very finely divided, and when the chips became heated from outside source the phenomenon of combustion actu ally took nince

#### Steam Turbine Street Cars for Long Island

A COMPANY has just been organized in New York city to operate an entirely new kind of street car line at Great Neck, L. I. Although the cars will ran on rails and will have every appearance of an ordinary electric car, they will be independent units operating without overhead wires, third rails or central power

The source of locomotion, which is the most interesting feature of this new medium of interurban travel, is a steam turbine supplied with steam from a fiash boiler, the turbine operating a hydraulic speed tran-mission and two oil motors connected with the two xies. The flash botter is located on one side of one lightform and is heated by means of either kerosene or gas oil instead of gasoline as in the ordinary type

what larger than the lower. The span of the biplane is 27 meters, and its total lifting surface is 130 square meters. The weight of the machine is 3,000 The aeropiane has an enormous lifting capacity Besides ten passengers it is designed to carry provisions, fuet for 20 hours and a miscellaneous load of 800 kilogrammes. As might be expected, the power plant is huge Four engines, each of 100 horse-power and each driving a screw propelter are mounted in the machine The fuselage is of wood and is shaped to servation cubin, a spacious pilot hou giass windows for two pliots, a rather large cabin for passengers, stores, tools, a corridor, and finally another cable in which a couch is actualty to be found for

hose who wish to sleep.

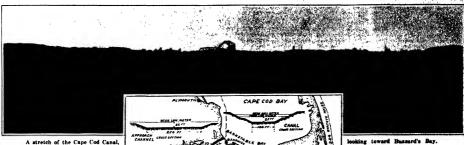
It is said that on August 2 the machine actually ers of 90 kilometers made a flight with seven passengers of 90 kilometers lasting not quite two hours at an attitude of 500 meters, during which the pitots took turns in the pitot house and passengers walked about as if they were in a city apartment Experiments are also said to have been made in cutting out two motors in flight and running the machine with the remaining set of two

the machine with the remaining set of two Naturally these accounts of the machine's perform-ances are received with condderable threshallty in France. To be sure, the acrostovical of Heart Dentiesh de la Meuribe gave a good account of liself in Grance, but French aeropiane designers wonder how equilibrium could be maintained with passengers moving to and fro in specious cabins. Moreover the speed obtained, less than twenty-five mites an hour, seems auspiciously low for sustentiation. Further details will certainly be looked for with much interest.

ard Time in Eritrea.—The Italian colony of Eritrea has just adopted standard time of the meridian of 45 degrees east of Greenwich. Its time will thus be an hour in advance of that in use in Egypt, Portugese East Africa and South Africa.

# The Cape Cod Canal

Saving Seventy Miles of Distance and Three Days of Time in Carrying 25,000,000 Tons of Freight



THE curved arm of Cape Cod with its curious fish-hook termination at Provincedown, which forms such a remark-able feature of the New England coast line, is of glacial origin. It was formed line, is of glacial origin. It was formed by the deposit of boulders and clay brought down from Labrador and Maine, and upon the substratum thus formed, the joint action of the waves and winds of the sea, deposited the sand, which in layers of various thicknesses and in picturesque contours, form such a plea feature in the landscupe of Cupe Cod | Iureature in the image appear to the vide-curving promontory is Cape Cod Bay Where Cape Cod Johns the mainland, at what might be called its shoulder, there is a narrowing down of the width from shore to shore until the distance from Barustable Bay to Buzzard's Bay is only eight Buzzurd's Buy lies between uninland and the southeasterly extension of Cape Cod, which latter gives the same protection to Buzzard's Buy that Cupe Cod gives to the buy named after itself. The narrow stretch joining Cupe Cod to the mainland has a surface elevation of only 20 feet above high water. It is composed mainly of sand with an occusional ad-



Man showing the location of the Cape Cod Canal, and sections of the canal prism



Entrance to the canal from Cape Cod Bay, showing the granite sea wall.

mirture of boulders. A glance at the map will show that the shipping which passes from Botton to New York and southern ports, or eice evras, whether it steams or saits through Long island, at pressout has to pass through Natucket Stoggi and around Cape Cod. Centuries of navigation have shown that the shoule of the Nound and the lee shore of Cape Cod render the route difficult and dangerous, the former because of the frequent fogo obscuring the lightships and lighthouses which are necessary to safe navigation, and the latter because of the dangers of the reefs and the lee shore of Cape Cod, upon which the Atlantic gains beat with great fury, particularly during the winter months.

great fury, particularly oursus to woter months.

The difficulties are aggravated by the fact that the larger proportion of the 25. 000,000 tons of freight which annually uses this outside route is carried in saliing ships and in tows, both of which are particularly exposed to the dangers of navigation above referred to.

In view of these facts, students of the

In view of these facts, students of the problem will see at once that, if the eightmile strip of land between the head of

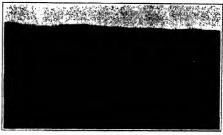
. West labor to the second of the



The rolling-lift railroad bridge spanning the canal near the Buzzard's Bay entrance.



The majority of the excavation has been done by hydraulic dredges of 4,000yard capacity per day,



This shows how a river was dammed to enable the steam shovels to work in the dry.



This breakwater, 8,000 yards long, built of large granite blocks, pressure the

offic Bay and Barnstable Bay on Cod Bay were igh and a desp-water channel formed, this would not only avoid the dangers of naviga-a referred to, but it would make the trip to en ports wife a very cons ng of time and distance

Several at these and therefore, the first property of Cape Cod Canel will at the nation itself; and we are all familiar the story of Miles Standish, who, an September 2007, whiled his boat up the Squaset River and Delications who is response to an urgent call, had main from New Amsterdam, by way of Buszard's Bay to the resons of the sorely oppressed colony. Later an seminimistan and survey were ordered by the High t of the colony. As far back as 1776, Georg imself recognised the military value of Wantington bimself recognised the military value of this sense; and when she found it impossible to send his known to New Nork by water because of the 8-mile barrier, he said "the interior barrier should be cut in to give greater security to navigation and against

the second. We have before us a chronological history of the Ougs foot Canal movement, which shows how company artist company was formed to cut the canal, several acts of Congress being passed to assist in the enter-Finally, Mr. August Belmont, convinced that and could be made financially profitable,

and moved not a little by the sentimental con-sideration that the canal would be built in the district from which his ancestors had come ecided to finance the undertaking.

The canal is being built at sea level; its length from shore to shore is eight miles; the length from the 80-foot depth in either bay is 13 miles, and the depth throughout the canal for the present is 25 feet. The width of the bottom of the approaches in either bay is 200 feet, and the width of the bottom of the passing places in the caual is 250 and 300 feet A breakwater 3,000 feet in length has been built for the protection of the entrance from Barnay. It should be noted that the turn in the channel has a radius of 7,640 feet ; the canal being practically straight fro to shore

From what we have said of the physical characteristics of the strip of land through which the Cape Cod Canal is being cut, it will readily be understood that the enterprise presents no features of serious difficulty, judged from the engineering standpoint, that cannot be mastered. There are no problems, arising from the unstable conditions of the rock other material through which the canal is exsuch as have added so greatly to the cost of the construction at Panama. The material is such that it will stand upon specified slopes and the banks of the finished canal are such that no crosion or washing away of the banks needs be anticipated. Most of the excavation has been done by means of hydrau-lic dredges. The dredging plant includes two of the largest machines of this type in the world, each of which is removing over 4,000 cubic yards per day from the canal. In one respect only have the estimates of the time of completion been upset, and this delay has e to the unsuspe been due to the unsuspected presence of n deposit of boulders, some of them of very great which have somewhat delayed the and have called for special methods of excava-

The work of the hydraulic dredges has been

supplemented by steam shovels, and the contractors have got such a good grip on the wor August 1st. 1918, there remained only 4,500,000 cubic yards of excavation to be done. During June July of this year, material has been taken out at the rate of 400,000 cubic yards per month, and it is ex-peried that this rate of progress will be increased until altates so e slowing down. If all goes the winter necessitates some slowing down. It all good-diffy well, it is expected that the excession will be completed by July 1st, 1914. The detail disthing un-thight ment be done before the cases is thrown open file concretion will be completed by the following No-members: This diverging of the fone-giles approach in ion may rigidate waters of Sipassiph's Bay is done and fast itsussiversize at the mentals, and in Barnestable Bay following Sichilar about displayed from of greatest is prac-ciable, speciales about displayed from of greatest is prac-

pictate of the Dupe Cod Canal as an engineering in sean when we compare it with being the depth for imparied mands. Although the depth for int will be 25 feet, it is impacted ultimately a cities permit the control of the permit the control of the consecution than the feet of the proceed Manchester Count. The least of the proceed Manchester Count. The least of the world manifestes through the former ign the blanchester Count. Section of the country of the country

piers is less at Manchester than the 150 feet on the Caps Cod Canal. Furthermore, there are three pensing points where the bottom is 200 feet wide; at the eastern end the width is 300 feet for nearly a mile and the approach in Buzzard's Bay has a width of 250 feet empleted canal will be illuminated through the street-lighting plan, and it will contain the various alds to navigation, these being of the most modern type Navigation will be easy; for it is well understood abroad, where canal navigation is common, that steaming through a lighted and community marrow channel, where the banks are well defined, is safer than steaming from one bright lighthouse to the next through uncertain intervening shoals. This it has been abund-

uncertain intervening shoats. This it has been anumantly and very bitterly proved by our own cosst pilots especially in passing around Pollock Rip.

The opening of the canal will offer an alternative route, the advantages of which over the old outside route are manifest. The average delay per round trip.

The average delay per round trip. per annum for burges in tow and schooners, which now take the Vineyard route, is from three to four days; and this means a loss in money of ten cents per ton on the seven million tons of coal and lumber carried by tow and sailing craft. Although this \$700,000 expense is due in part to the delays at terminals, it is a fact that the barges to-day average only one

M HESA PEAKE 30 BOSTON ΤO BEAUFORT

The system of intra-countal canals, for which Congress is asked to e appropr

round trip per month between the Chesapeake and Massachusetts. The new canal will have sufficient depth to accommodate this traffic and all craft drawing up to 28 feet—a margin which covers all but six of the els at present engaged in the coastwise trade

Regarding the advantages of navigation, we are in-rmed by Commodore J. W. Miller that vessels run out of the southerly rains and mist region as they pass out of the southerly rams and mast region as they pass. New Bedford, and that, as a rule, they carry clear weather and a smooth sea all the way to Boston; while Government statistics show that there is 50 per cent Government statistics show that there is on per cent less fog at Plymouth than at Pollock Rip. Only two northeasters blowing over 40 miles an hour have oc-curred at Sandwich during the past 18 months. Hence the run from the breakwater at the Barnstable Bay entrance to Boston is far safer than skirting the ice off the Cape.

Of the military advantages of the canal it is scarcely necessary to speak. Its present draft of 25 feet will be ample for the smaller cruisers of the navy, for a be ample for me anather crumers of the many, for a large part of the anxillary ships, and for the whole of the torpedo and submarine fleet. Should the United Stakes Government take over the canal and increase the depth to 55 feet, it would then be of sufficient capacity to accommodate the largest bettleships of the mery—in which case it would form an important link

a Branca

in the system of intra-coastal canals which forms the subject of another article appearing on this pag

#### Intra-coastal Canal System for the Atlantic Seaboard

THE present widespread movement in favor of the I construction of a system of intra-constal canals be tween Boslon, Muss., and Beaufort, N. C., has received strong support in the form of a recommendation to Congress, made this month by Brigadier General Bixby. Chief of Engineers of the Army, in favor of the con-struction of the canal by the Federal Government

The arguments in favor of putting through this great ork are based upon the favorable physical conditions along the proposed ronte, the advantages that would be derived by our constwise traffic, and the mival and military value of a chain of interior canals in time of

If a study is made of the several maps which company this article, showing the Atlantic Coast Line from Boston to Besufort, it will be seen at once that its configuration is such as to invite the construction of the interconnecting canals. Cape Cod Buy, Long Island Sound, New York Buy, the Delaware River, and reaches of Chesapeake Bay, Albemarie Sound and Pamileo Sound, already afford several

inudred miles of protected waterway, far re-moved from the const line, which, if connected by canals, would afford a contlunous interior route, protected alike against the shoals and heavy gules of the Atlantic, and against ats by the ships of a hoslile navy

As the result of several years of earnest work on the part of the various commercial in terests, shipping and otherwise, Cangress authorized the army engineers to make surveys and estimates to determine the feasibility of the scheme, considered as an engineer-ing proposition, the prospects of a sufficiently large amount of traffic to warrant the cost of construction, the mayal and military ad vantages of the canal in the event of war, and the best size and type of canal to meet all the conditions, present and future

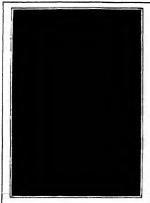
It should be mentioned here that the report of General Blaby concerns only a portion the vast scheme which has been proposed for building a continuous line of canals from Boston, Mass., entirely around the Atlantic and Seniourd to the Rio Grande River. When the Boston-to Beaufort section of the scheme has been completed, and after it has demonstrated its commercial and military value. the serious consideration of the Beaufort to Rio Grande section may come up for consideration in any event, that will necessarily be a matter of the far future

Great credit is to be given to the Atlantic Waterways Association, to whose orgunized efforts was due the provision made by the United States Congress in the River and Harbors Act of March 3rd, 1905, for a survey by the Engineers Corps of the l'ulled State Army, "for the construction of a continuous waterway, inland where practicable, from Boston, Mass to Bennfart, N. C., for the Boston, Mass to Beaufort, N. C., for the with a maximum depth of 25 feet, or such lesser depths along any section as may be found to be sufficient for commercial, navai or military purposes." The present recom-mendations of General Bixby are based on the report of the Special Board of Five Army En-

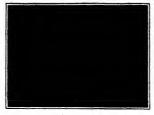
gineers, which, acting under the River and Hartor Act, as mentioned above, was engaged for several years surveylng the route, and presented a report thereon to s last year At that time Congress appropriated funds for the purchase of the Albeniarie and Chesupeake Canal and the commencement of construction of the section from Norfolk to Beaufort

The first stretch of the original proposed 25-foot waterway is that between Boston and Narragansett Hay. Estimates made by the Army Engineers showed that a caust, 18 feet In depth, one Boston and Plymouth would cost \$17,500,000, and an alternative canal, 25 feet in depth, via Trunton and Hinghaus, would cost \$40,000,000. The Engineers also considered the advisability of purchase by the United States of the canal which is being constructed by private capital nt Cape Cod. Commenting last year on the report of the Special Board, the chief engineer agreed with its finding that at the present time there appears to be no commercial necessity sufficient to justify the construction of the canal over either of these inland routes. He considered that after the other section of the intraconstal waterways has been constructed, and the measure of relief to commerce to be afforded by the Cape Cod ship canal has been demonstrated, the question of

(Concluded on page 197.)



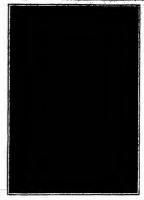
Normal condition of sensitive plant before being chloroformed.



When the saturated cotton wool is in position the glass shade is placed over the plant, and the whole is imbedded in hay.

# Can a Plant Feel Pain?

By S. Leonard Bastin

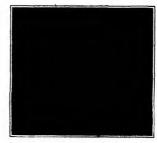


Same specimen after chloreforming shows no sign of feeling a flame.

I T is now generally recognized that there is no essential difference between the evidences of life in the plant and in the animal; there has never yet been any satisfactory chemical distinction which clearly selectrize the protophan of the two types. One can offer no reason why the vital matter in the plant should not be camble of performing that which it is seen to accomplish in the animal. Small wonder then the Dr. Francis barvin and others should discuss the question of plant consciousness and seek for signs of memory in the vegetable being. Certainly the so-called "sleep movements" in the bean, in connection with which some chalurate experiments have been carried out, appear to show that the plant has, to an extent the ability to remember. In this case it would appear that the falling of the light in the evening gives the signal of the developing of the leaders; it is found however that a bean plant which has been kept in the dark for a few days will continue to expand and close its leaf-lets at about the hours of sunset and souries. As Dr. Darwin had pointed out, we can evertainly red that the plant, or perhaps one ought to say the protoplasm in the cells, remembers that movements are carried out at certain times and these proceed even though the original silandius is warting.

Another very interveding problem in connection with vocations of the second of the question. Can plain for justice, the control of the question of the proter pair. Now, atthough that is a word with a definter asseming to human belings, it probably has a very the second of the probably has a very supertice as a second of the probably that a very the most case which would cause a man the most case with the probably has a very to a jobly dish; in the will have only a small descondror to a jobly dish; in the plant, can scarcely involve suffering in the sense in which can scarcely involve suffering in the sense in which can be called the prosent of the probable of the probable of the proposition of the probable of the probable of the writer had the opportunity of witnessing some very intreasing experiments with a senditive plant to demonstrate the extent to which the specimen might be said to feel win.

The example chosen was a young and vigorous plant of Mimosa pudica. Of course the degree of sensitive-



Leaves of a vigorous sensitive plant spread in normal condition before the application of a flame which touched for a portion of a second the tip of one of the leafists.

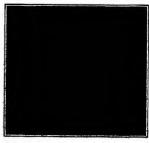


In the operation of chloroforming the sensitive plant, the liquid is poured on a piece of cotton wool, which is placed near the stalk.

ness is at its height when the leaves are in the most actively growing condition. The foliage was extremely responsive to cold air and the slightest touch, closing its lenders and dropping its statics with greet promptinde. It was ectabled, to try the influence of a finne minor the sensitive leaf. A piece of wadding asturated with apirit was set alight, and the finne was passed rapidly under a well-developed leaf. The organ could not have received more than a whiff of hot air, yet it gave very clear signs by the movements of its leaflest that a sensation, which we may call discomfort, had been produced. In the next experiment the finne was allowed for a fraction of a second to touch the tip of one of the leaflest. The outcome was autosiding; the whole leaf skrank as if it had experienced the most neutre pain.

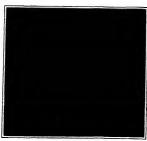
It was now decided to administer an anseshed: to the sensitive plant. For a long time it has been known that the mimosas are markedly affected by the vapors of chloroform and other. The method of administering the ansesthetic is on the following lines. The pot is which the plant is growing is buried in hay or some such substance. A large glass shade is then procured, which can be placed over the specimen. A good-stade piece of wadding is well soaked with the chioreform, or whetever the anesthetic may be; this is placed by the plant, and the whole is enveloped in the shade. After an interval of half am hour it is to be noticed that the foliage or the sensitive plant begins to droop. The leading squality close together, and finally the whole plant passes into a sleeping condition, even more protound than that which normally occurs when the light begins to fall. That the sensitive plant is "unconscious" there is the very best reason for belleving, seeing that it quite fails to respond to any touch. A more severe test still was the placing of the lighted wadding under one of the leaves. Here again it was evident that the ability to feel was quite in a state of suspension, just as completely as when an individual is under the influence of an anesthetic.

There is little doubt that, before long, we shall have yet further to revise our views concening the senations of plants. Of course for some time it has been excounted, for instance, that regetable tissue is coursely of a response to the stimuti of light and heat. It has slaway been argued than plants could not feet pain or discomfort because they have no nerves. The modern physiologist asks himself the question, what are nerves? To this there is only one naswer—modified and highly specialized protopiasm. We have seen that the life should not be able to act as a radimentary herrons system. As we how know the protopiasm in the plant should not be able to act as a radimentary herrons system. As we how know the protopiasm is not connect to the cells of the plant; ting strands of the living matter are able to peas through the walk, and thus keep up some sort of communication throughout the entire plant. These threads of protopiasm have often been spoken of as the nerves of the plant. This they are most decidedly, not in the britiary sense of the word. There is strong reason for believing that in some ways they carry out the functions which are usually performed by a nervous system.



A piece of cotton-west seaked in methylated spirit is ignited and held for a second ander the leaf of the sensitive plant. The last at sense closes.

Wards at Carlother Will



The sensitive plant undergoing the chloroform

# The Heavens in September

#### The International Union for Solar Research and the Astronomische Gesellschaft

By Henry Norris Russell, Ph. D.

IT would probably be a very good index of the degree of anyone's acquaintance with men of science if we could know what image was called up in his mind by the mention of an international scientific congress; and therefore it will bardly be necessary to tell th therefore it will bardly be necessary of the Scientific American that such meetings are of the Scientific American that such meetings are an american and american are a such as among the most enjoyable experiences—quite apart from matters of professional interest—that fall to the let of their members

A STATE OF THE STA

The writer is on his way home from two s erings, the meeting of the International Union for Solar ch, at Bonn, and that of the Astron sellschaft, at Humburg, immediately afterward.

The first of these was thoroughly cosmopolitan. Of the nearly ninety astronomers who attended the conference, scarcely one third were Germans. The Eng-ilsh-speaking delegates—divided aimost equally between the two sides of the Atlantic—made up another third of Of the remaining thirty, twelve were Frenchmen, five Russian, and the rest represented almost every other nation of Western Europe—Italy, Austria, Holland, Belgium, Spain, Denirk, Norway, and Finland.

In a body of such varied membership the proceedings necessarily take on a polyglot nature. English, French, and German are equally the official languages of the Union, and all business notices and formal motions are announced successive-ly in all three; while, during the discusslons, speeches in one language may be answered in another, with almost bewildorlug rapidity.

The regular proceedings of the Solar Union differ from those of many similar societies in that no formal papers are pre senied, though informal accounts of work done by individual members are sometimes The principal work of the organi gallon is done in the sessions of the unitie, with such subjects us the establishment of an accurate and uniform scale of standard wave-lengths of reference lines sludy of the Sun's rotation by spectroscopic methods; with the measurement of the Sun's radiation of heat; with the spectra of Sun-spots; and with the classification of the spectra of the stars. These committees, which may have as many as len or lifteen members, usually include all, or almost all, of the principal workers in their especial field, and their recommendations therefore come with an authorily which usually secures for them manimous acceptance.

The results of such committee work are rarely at all spectacular in character; but they save great expenditures of time and energy on the part of astronomical workers. For example, the committee on standard wave lengths were able to re port at Bonn to the effect that the measurements various observers in different countries gave results for the wave-lengths of the standard lines which agreed with one another, on the average, to within one part in two or three millions; so that a trustworthy and exceedingly accurate basis for future specire measurements is now in sight. On the other hand, the committee on the Solar Rotation announced that the comparison of the results obtained at different observatories showed certain small but "systematic" diff in the measured rate of the Sun's rotation—that is, it is found to be more rapid by some observers than by others, by an amount which, though very small, considerably exceeds the still smaller discordances b the results of measurements of different plates taken at the same observatory. In such a case as this, the caus of the differences must be found, and, if possible, r By exchanging plates siready mea observatory, between Ottawa and Mo suring them at the other, it was found that these the plates were taken, but in the measurement of the small displacements of the lines shown on the plates. It seems that in spite of all precautions one observer may measure the amount of this displacement greater or less—by an aimost infinitesimal quantity—than au-

ther observer does. investigations are still in progress, and there is resent to hope that these differences already ex-

Marie Marie and the second

ingly smail-may be brought to the vanishing point by suitable methods of observation. Meanwhile, the attention of observers is to be concentrated on the detection and removal of these small errors, leaving, until the time when they have been conquered, the study of such fine points as a possible difference in the rate of rotation of the Sun when measured by eans of the lines of hydrogen, of Iron, or of the heav-r elements. This may seem an unsatisfactory sort of report at first sight; but it is far better to know that amall errors exist, and to be out the track of their cause and remedy than to be going on accumulating with great paths and labor results which are infuenced by these errors; and without the general co-operation of all observers they might have remained undetected for

The committee in the classification of stellar spectra affords still another example of the advantages of cooperation. Up to the time of its appointment, there were three or four quite different methods of describing the spectra of the stars, all more or less in use

NIGHT SKY: SEPTEMBER AND OCTOBER

the first meeting of the committee, it was found to be the unanimous opinion of its members that the system of classification developed at Harvard was the best in existence, and should be adopted pending the construction of a perfected system, which must still be some years in the future. Correspondence with other astronomers brought out an almost unanimous agreement on this matter, and the recommendation of the committee was unanimously adopted by the Solar Union. In future, therefore, all astronomers, when discussing stellar spectra, will (so to spenk) be talking the sume ianguage, and much confusion will be avoided

The Astronomische Gessellschaft, though numbering upon its rolls astronomers of almost every nationality, is predominantly German in membership, and its proceedings are conducted in German Here, too, there were committee reports, dealing largely with the rebut there were also many formal papers, ranging over the whole field of theoretical and practical astronomy. As examples of the excellent work which is being

ne may be mentioned a paper by Dr. Rosenberg of done may be mentioned a paper by in tocessing of Libbingen, who has developed a new photometer, based upon the photo-electric effect (the emission of negative electrons from a metal surface under the action of Using a surface of potassium in vacuo he has ded in getting results which surpass in precision those of all previous instruments, even the selenium photometer with which Prof. Stebbins has had such

" Again, Prof. Hayn gave an account of a study of the shape of the Moon's limb, in which, by measuring upon

a long series of lunar photographs, the distances of many points of the edge from the center he has been able to construct a contour map of that region of the Moon's surface which forms its apparent edge under the varying angles of libration. This is not sloply of interest in itself, but will be of great value in the reduc-tion of linear observations. Suppose, for example, that an observer watches the occultation of a star behind the Moon, and records the exact instant of its disapnearance. Such observations, if the Moon were perfectly ud, would give us a very accurate deternduation of its position in the sky at the moment of observation irregularities of her surface, however, tutroduce serious errors. If the star happens to go belilled a mountain on the Moon's edge, it will obviously disap-pear sooner than if the surface were leveled off, if it strikes a deep valley, it will remain he sight longer By reference to Dr. Iiayn's map the computer can dete mine whether either of these things happened, and allow for the resulting error, so obtaining much more accurate results. The scientific side of these meetings accurate results

Important and interesting as it was hardly occupy a larger place in the memory of the delegates than the personal element. Public and private loopitality was of the most generons and delightful great German Bour, Cologue, and Hamburg—entertained the astronomers right royally, and our scientific hosts at the various observatories left us under an equal debt of kind-ness. And these festivities laid more of meading to them than the ordinary public One note was heard again and again in the addresses of welcome, and in the responses (which, token together, represented six or seven different languages), that of international good-will he such a gathering, where personal friendships add to the condion bond of scientific in-terest, differences of nation, race, and creed drop out of sight; and we may hone that they contribute their share, not only to the advancement of human knowledge, but to that of human brotherhood as well

The Heavens.
A glance at our map shows as what we may see in the evening sky. The great of Pegasos is high in the south Below it is the large but falut constellation Pisces, and the still larger, but more consulctions form of Cetus. right, low in the southern sky, is Fomilhant, which, though distinctly fainter than the standard first-magnitude star, is very conspicuous on account of its isolution. Aquarlus, above It, and Capricoraus, to

the westward, are dull constellations, the westward, are dull constellations. The far southern group of the Crane (Grus), which may now be seen below Fomalhaut on a clear night, would be conspicuous if viewed from a lower latitude.

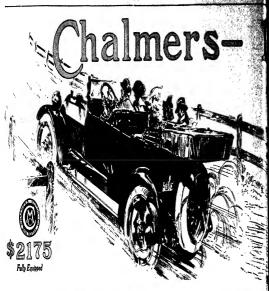
in the southwest, along the Milks Was, is a for ther on, Sagitturius (now brightened by the presence of Juniter) Is low on the horizon. Above it, all the way to Aquila, extend the great star clouds of the finest part of the Galuxs Was Still higher, west of the zenith, are Cygnus and Lyra Hercules and Corona Boreales are below the latter, and Optinchus and Boötes are setting. The Great Bear is low on the northern horizon, with the Dragon and the Little Bear above it. Auriga is rising in the northeast, and Persens and Auriga are above him in the Milky Way. Andromeda and Aries are high in the east, and Tourus is rising

#### The Planets.

Mercury is morning star until his conjunction with the Sun on the 16th, and evening star afterward, but he is practically invisible except at the very beginning of the month, when he can be seen, just before dawn, close to the bright star Reguins, which he greatly exceeds in brilliancy. Venus is also morning star. In Cancer and Leo, rising about 2:20 A. M on the 1st and 3.20 on the 30th. On the morning of the 25th she is very near Regulus, only about fifteen releates from him, and the star, bright as it is, will be almost lost

Mars too is nominally a morning star until he comes into quadrature with the Sun on October 2nd; but being very far north, in Gemini, he rises at 11 20 P. M. at

(Concluded on page 184.)





# The Master Motor of Them All

ing for we give you in the New Chalmers "Six."

To the best features of the costlicat cars we have added these crowning

Silence at all speeds; silence that lasts. Sustained power; even after years of use

No vibration; comfort and long life. Extreme flexibility, without intricate gearing.

#### Silent At All Speeds

Sident At All Speeds.

Many man has region with mains as low, bit as the side as low, bit as the side as a surface from side as the side as of a side as the side

#### What Silence Tells You

What Districts (1881) mass more than the men inter of spirit. Let's no its story as we share men itsner of spirit. Let's no its story as we share man, more than the men itsner of spirit and the man rich till spirit and the spirit a

the luxury they bring. They mean minimum wear-no waste of power. A car that lacks them, may cost you less to buy-but it will cost you more to keep.

When once you know the years of extra service these features add, you'll wonder how we give them at the price, \$2175.

Go ride in this car. Let it tell its own story in deeds. It can neither over-rate its virtues nor hide its defects. It must tell the truth-nothing else.

#### \$80,000 Extra Cost to Us-An Enormous Saving For You

This motor, like the trained ethlete, grows better

by solion.

The cast bon and neckel steel valves in general me today soon begin to show west. They are soon pitted and warped by the blastering best of the cylinders. They full to shat tight; they waste power; they have

They fall to shat tight, they made power; they have to be reground often.

Our valves of Trappine sted cost to \$80,000 extra per year. Hot Trappine sted is not affected by the opinion than the home to margine leading—no power wasted. They skinned never need reprinting. This masses an entronce swing of power to year. It means to the margine of the years of extra service this master motor will rive year.

#### Power-Supple as a Fencer's Wrist

The power of our New "Skr" is so fissible that you an throttle it down on "high" to a creeping gait in the crowd; then away swit as a smallow, mounting quickly to twenty, thrity, forty miles an hour without stress or effort.

#### SALIENT FEATURES OF T NEW CHALMERS "SIX"

Six-cylinder meter, Thead type, 4:5% -40.65 h.p. All moving parts enclosed. Pressure and splash oiling system. Cork insert clutch.

Bosch Magneto Electric Starter-Entz System, bulk in Chal-

Non-stallable Motor, Full Electric lights.

132 inch wheel have Molded oval fenders.

This is due to our big, roomy valves; they open 40%, when and into tighter than common. This give they cause to the pass. The various facilities of the motor is maxing, levell find you can do mostly excepting on "high." It does many with gene ability amost entirely. With this "first" any emphemotry par meakagem would be maken. The motor limit gives a supplement of power unknown events in coolider one.

#### A Non-stallable Motor

This notes will serve go dead to the covoide dity bails. The electric states won't let it.

Even if the cliver should set off the pas seekless states, which is always to day, they are training—serv't let it step.

It presents stalling under sudden overdood. This is the present feature of salety and convenience paid on each in the past from the salety. Steep hills, madely or mady roads never wanty the motor of the New Chalence "Biz."

#### An Electric Starter That Never Quits

The displiest and surest starter over made. A little motor spita the copins to start it. Then it reported limit, becomes a generator and stores up power in the battery for electric lighting and intere searing per-

ucline Tank and tire carrier on rea

36x41/sinch tires and Continental De-mountable rims. Four forward speed

Underslung rear springs; main leaf of vanadium steel. l'apered bonnet and stream line, bell backed body.

And it does it without attention-without aid of automain devises. You simply threw on the sw at starting and forget it. This starting and ligh system is built entirely in the Chalmers shops.

# That Vibration Jinx

After a long ride you are often tired and you don't mow why. It's the ribration jinz in the power plant, it means the moring parts are too heavy or a fraction

ome vibration in this way: We have found

it surrouses relation in this way. We have beard up to large our someofting rade to they are storage yet the highest mat the arrange. We give the motor an early long strike and on-the number of the strikes. All merting parts are therefore a deliberty small, we see that the large was not behaved with the next of the motor, we have much the arbanics of the New Thi' im-respille. The interpret of the mothen souther like a new the surrous of the mothen souther like a

plathy. The months are the "fix" area were on the sat as well as on the passengers. The intered between or plating of any "five?" makes a gap in the power from Theories as some from the vitrasion that the spoin the power resum of the "four" produces. The updated of the "fix" gives an inherical stress. The updated of the "fix" gives an inherical stress of "fixe" was uppeal, It adds years to the life of the sax

#### Snap Your Fingers at Poor Gasoline

With our New "Six" you can use the low grades of pushing because it gets the gas better then commen. We hant the gas in three ways to make ear; by two factors of hel water and one of het six. Every atom of gaseties is known itself one of the tweether and one of het six. The wasse an ecomous strong in a season's fact bill.

#### Stop Craning Your Neck

In chirty this ray at these years which dis-cut height. To cause or close-young near which offer, an immune solvening in neaposite raise. The notice solvening is neaposite from a fine proper than the proper of the ray the side-older—room on one from other consections. If however, the close is the consection of the ray of the con-traction of the consection of the result is not to take the close of the consection of the con-traction of the contraction of the con-traction of the contraction of the con-traction of the contraction of the c

#### Four Eyes In Two

Search lights are forbidden in some cities and in many others they not will be. So fee thy driving we have a two auxiliary electric lamps of modernic power in the top of these ligh, power-tal search lights meshed for country driving. This errangements are way with able lights extinctly. All lights are operated from the dash.

#### The Beauty of the Car As we make the motor better we make the our

managemen.

We spect \$75,000 in new equipment to give you like long eval feature; not alone for the added beauty, but for their utility as well.

long wall indirect, see should not be added beauty, the factor within a wife of the addition and the angle year. They care seem of them a sleep joint of any year. They was reposed from a sleep joint of a sleep joint of the seem of the

Chalmers Motor Company. Detroit, Mich.

#### No Need to Pay More; Unwise to Pay Less

It is impossible to get more real value than an give yould the New Chalmen "Son." The worder is that we can do it at the pures.

But this war is the product of a \$7,00,000 funders, where evenues to predict the last how perfected as never before; where currantes origin trebuces used to a

Our company is more than a more overwriter. It is an expanisables, made up of two spotted by one common ambition to produce a car as near perfection

common arbitant la proture a ce se unes pour seas anne on makel. In the New "So "you get features that move your are all may see after year as smoothly and strettly as the day you bought it; features that keep operating most defents to be instituted.

To keep our that heads these features—even though the first cost is less a short eighted. To pay more as an extravegance on our opinion.

#### Let the Car Tell Its Story in Deeds

We want you to take a ride in the New C3 desers "Rix" - a ride that will make you prefer this our above

"Will"—and take will make you pertrum one soone all others.

That ride is just a risk. It is the Chalmers Stand-Board Stet.—a part of our require rails via list and by all our duders justices which is it his limits will are sold year of the risk will be the sold proposed to the results of the sold proposed to the results of the sold proposed to the risk will be care beard of the sold rails will our list be a risk of the risk will be come beard out to the risk will be come to the risk will be represented by the risk will be represented to the risk will be r

All bodies interchangeable.
Prices include full equipment and are f. o. b. Datroit

#### Send for the Facts

and us this compan and we will mad you one of the out interesting and valuable hooks ever written about retor cars. It tells by purtures and words farts that very one abouid know. Mail the roupon new.

Send me literature explaining why the New Chalmen "Six" is the Master Motor of them all. Name ... Street City ......

# South Carolina Thin Testing Olingo Chalmer No. Dentur - Dentur Arte Dentillo & B Collin Lammer No. Lawren Colubert - Lawren Seefs Debets

N official test was made, last month. A by M. Louis Biérlot, of a new brunching apparatus, particularly adapted for use on board ships and on land where the surface is too rough for the aeroplane to acquire the speed necessary to raise it off the ground. Two pairs of pules were erected 250 feet apart, the members of each pair being 65 feet apart and spanned by stont cables. Stretched between these spans was a main cable which formed the brunching track. On the flying ma chine a wooden frame was supported which terminated at its upper end in a pair of outwardly curving horns. At the vided which could be opened by pulling a Bieriot skilfully maneuvered the machine so that the borns would struddle the catle and the bitter would be caught under the If he wished to lannch the machine he set the propeller going and let it run along the cable until it had acquired suffcient speed, when he pulled the latch and ed the harlzontal rudder sufficient ly to pass under the end span of the cuble The apparatus calls for some very nice senvering on the part of the operator which might be absolutely impossible of achievement in gusty weather, particu-tarly if the wind did not happen to blow along the line of the cable

#### Where One Old Car Has Gone

"W HERE do nil the old cars go?" VV is a question that is usked con-tinually, and there are very few persons who can even approximate the answer with any degree of sutisfaction either to themselves or to others. But it is certain where at least one of them has gone for it is shown in all its new glory as a sedate lawn mower, by the accompanying The reason for its fall from aristo cratic to pleblan work is because its owner has a really tremendous lawn to keep in trim; he is head gurdener for a larg golf club and as every one knows putting greens must be kept "just so". There was an antiquated two-cylinder automobile on the premises that long had ceased to be of any practical value for pleasure purposes and the gardener conceived the bright idea of making it "die in the inrso to speak So with the help of some steel strips and some chains he attached no less than three lawn mowers to it—originally they were drawn by horses. The steering gear is intact except that the place of the front wheels is taken by a heavy roller; two rollers take the place of the driving wheels.

#### Bridge Erection Without Scaffold

THERE was a remarkable demonstra-tion of bridge construction at Hessen-winkel, near Berliu, recently. The bridge in question was nu fron road bridge of 150-foot span over the Milggelspree which at that point makes a sharp head and has rather violent currents. As a stationary scaffold would have interfered with the very heavy local pavigation, the contractors, Messes Breest & Company of Berilu, suggested erecting the whole bridge m land, and eventually moving it seroes the river by means of an ordinary burge of 200 tons carretty. The arrangements made to this effect comprised a stationury wooden trestle on each bank of the river and a guide path of double T girders and ratis connected therewith Having been placed on small from two-whee trucks, the bridge was on these guide paths moved out sufficiently for one end to rest on the wooden trestle lustailed on the barge. The barge, which had been weighted with sand, was then slowly un The barge, which had been londed and rose, lifting the bridge off the forward trucks. Then, resting on two trucks at the rear end, the bridge was moved on by means of wnoches histalled on the opposite bank (operated by four men) until its point reached the treatle on this bank. After supporting this point again on two trucks, the last advance over

Launching an Aeroplane from a cable the abutment stones was quickly made. The floating of the bridge across the structure occupied 11 minutes, during which time purlention bud to be engranded. The net weight of the bridge totaled about 80





nance in Wood

I T has long been known how indispensa-ble the conferous woods are for certain

technical and structural purposes, as a re-sult of their uniformity in structure, ease

suit of their uniformity in structure, ease with which they can be worked, and their

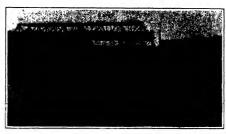
The taunching horne

About to sales the cable

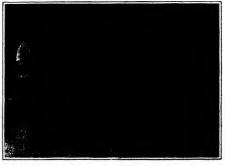
#### Blériot's aeroplane launching apperatus.



Using an old automobile to haul lawn mowers



Moving the bridge across the river on a barge



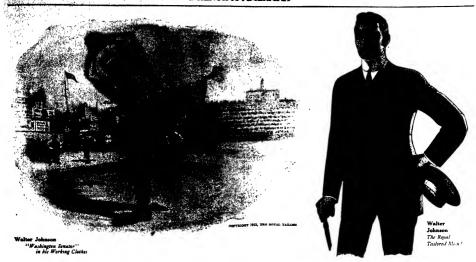
Electric car operated by the contact system.

capacity to return to their original fi when subjected to a strain. Upon what structural characters these qualities are endent is not separally known. and even science has not taught us very many useful facts about them. Amati. Stradivari, and others knew by expects the wood of spruce from the Alps pos sessed the quality of resonance to a mus greater degree than other woods wh made into a violis. The reason for this should be sought in the structure of the

Coniferons and broadlenf trees produ wood of widely different physical proper-ties, which are determined largely by the structure of the wood. Conferous woods are composed largely of vertically guted, closely packed wood fibers technically known as tracheids, and those of broadleaf trees are made up of wood wood-parenchyma fibers, and ves sels, all of which vary in size and thickness of wall. In the former the wood is simple in structure and in the latter it is very complex. Both groups of woods have horizontal rows of cells which extend from the pith or center of the stem to the bark. These are called pith rays. In coniferous woods these rays are usually only one row of cells wide, while in broadleaf trees they are often much wider. For instance, in the oak woods they are very conspicuous on a smooth transverse surface and often form nearly 30 per cent of the wood mass. The presence of these relatively large rays and porce or vessels in the wood of broudlenf trees naturally disturbs the regular arrangement of perpendicular elements, which is not the case in coniferous woods. The uniform structure combined with the great strength and clasticity of many conferous woods renm suitable for producing sound waves of different intensities. Of all our esses this native woods, the one that pass property of resonance more than any other ie spruce of the Northeast. This quality is to be found more especially in woods with perfectly straight fibers and narrow unual rings of growth of equal width. Defects such as knots, cross-grain, resin pockets, minute season checks, render the wood nufit for sounding boards. Very light woods with uniform structure comlined with great strength and elasticity are invariably selected for this purpose, and the spruces fill this requirement better than any other known

#### Contact System of Electric Haulage

I N a busy steel plant at Burnham, Pa . an electric hanlage system is being successfully operated day and night under the nost trying conditions. This hanlage sys tem uses neither trolley nor third rail, but surface contact made underneath the locomotive. As shown in the accompanying photograph the locumotive carries a contact rall, adapted to bear against boxes placed between the trucks. These boxes are so-spaced that at least one of them is always in contact with the contact rail. The contact loxes are flead, except when depressed by the contact rull, so that the system is absolutely safe at all times. The plant where this system is in operation is so crowded with furnaces, machinery and iron rolls that the tracks must be tantly crossed. Hot bars of iron from the furnices on one side of the track are being continually transferred to rolls on the other side. From the rolls the bars of white hot iron are passed back over the track again, so that the system receives two hot baths from every piece of iron that comes out of the furnace, and it becomes so hot that it is necessary, from time to time, to flood the roadbed with water. In another part of the mill enorwater. In another part of the minimum mous shears are in operation cutting our axies into the proper length for use in the furnaces. These shears are so near the axies into the proper length for use in pass are furnaces. These whears are so man the tracks that the heavy axies are frequently dropped on, the rails and piled up on boxes; yet the system is not harmed in any way. The absence of poles and over head wires makes this type of electrical A CONTRACTOR OF THE CONTRACTOR



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that in Life's game good clothes are a mighty important factor. A man can't maintain a high batting average in the world's esteem if he wears the uniform of failure. That's why the wisest and best known stars likeTyCobb, Walter Johnson and Ed Walsh have "That

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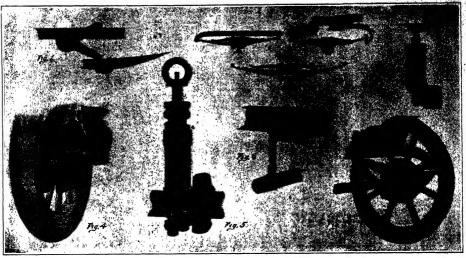


New York



## Inventions New and Interesting

Simple Patent Law; Patent Office News; Notes on Trademarks



A few of the more prominent types of shock absorbers.

Fig. 1 Bibow type Fig. 2.-- Auxiliary spring Fig. 8.—Air cushion Fig. 4.—Einstie sbackio. Fig. 5.—Hydraulic. Fig. 6.—Rebound check. Fig. 7.—Pheumatic tire apring.

#### Shock Absorbers for Automobiles

ANY device attached to an automobile to prevent of the taw violent deflection of the springs of the correct or to eluminate the recul after deflection due to irregularities in the road surface, is commonly known as a stock theories. Automobiles, almost without exception, are equipped with semi-ciliptic, full ciliptic or three quarter ciliptics springs while are usually blacked alove the axies to irredde a flexible support for the body. These springs are usually designed so that the average or normal load on them will give the maximum deflection. This being the case, they will provide a proper inxible support for the body and give easy rilling qualities only within a certain range on either side of the normal load and maximum deflection. It was for the impuses of overcoming these difficulties that the sheek shocker was primarily designed.

Where the lead on the ear is considerably under the normal the edection will be very slight on account of the stiffness in the springs. Also, where the lead is excessive the detection will be violent. Shock absorbers are deshared to obviate both of these drawbacks, and may be generally divided into two main classes as follows 1. Those of the elastic spring shackle type for light loads, and 2, these which act as spring retardors or stiffners.

The various types of shock absorbers differ so widely in construction and operation that they may be properly subdivided into six classes as follows: 1 The cliow type: 2 Auxiliary spring type: 3 Preumatic 4 Elastic shade: 6 Hydraulic 6 Rebond checks. There are no less than forty different shock absorb-

There are no less than forty different shock absorbers on the market to-day, but as they are all included in the above six classes it is necessary to give a description of only one of each type. The device described is, in each case, shown in the accompanying illustration.

#### The Elbow Type of Shock Absorber.

In Fig. 1 is shown an example of the obow type of shock absorber which does not, like most of this type, depend upon friction for its resistance to motion. It completes of a triple, circular coil compensating spring, the ends of which need opposite sites of an adjustable stop, part of which is connected to one arm of the device and part to the other arm. A large center holf, 1½ inches in diameter, holds the case, cup, and two arms together, and is grooved to hold greate for intricating this joint. The triple spring is 14 inches long and on a 5-inch movement of the chassed spring its

total compression is only one fuch. Owing to its great length compared with its extreme morement during compression, there is little liability for breakage or that it will take a permanent set from its continued action. These shock absorbers are made especially to it a car of any weight, the tension of the spring being adjusted accordingly and the proper tension being held by the adjustable slop.

The Trufanit-Hartford is another absorber of the ellow type, though II does not employ the culled spring system. Most shock absorbers of this type operate on the friction principle. The Truffanit-Hartford was fully Illustrated and described in a former base of the Soukerite America's.

#### The Auxiliary Spring Type.

This device, linearised in Fig. 2, consists of a linear semi-clipick spring, made of circone-variandium steel. It is slightly more than half the length of the chaesies spring to which it is applied. It is invertible and is in line with the master leaf above which it lies no closely us to be scarcely noticeable. Interposed between it and the clauses spring, in the center, there is a short steel block just high enough to keep the overlanging tips of the spring just touching the upper surface of the master leaf when it is under normal load nosition.

When the chasels spring he compressed by a shock imparted to the wheel of the cur, the auxiliary does not touch it nor in any way affect it while it is bedge compressed, but out the reced the tips of the spring energy with the master leaf of the chasels spring as soon as it renches normal load position. At first it encares resulty, then with gradually increasing force, checks the reced until its sharp quick action is reduced to a stow casy motion and finally entirely overcome. The redsmost is reced its applied along the top of the master leaf of the chasels spring, thereby pre-tenting it from being jerked upward and away from its supplementary leaves by the inertia of the car body. With each oscillation of the chasels springs the absorber makes and browns contact with the master leaf, alsowing the little shocks entirely and protecting the body of the ear and the motor from harmful vibrates.

#### Paeumatic Air Cushion.

The graduated air cushion, Fig. 3, consists of a holithe cylinder, closed at both ende, in which a piston moves up and down. The lower cylinder head is provided with a universal ball joint and a clamp for consists of the modified in the cylinder head.

- Modella Carra. Pra. 11-1 baddanic Sira apringi

per cylinder head the piston rod passes through a gland and is connected by another universal joint to the channel frame of the car. Through small cylindrical holes in the cylinder walls, both above and below its center, air is alternately admitted and expelled from the cylinder. These ports are so located that the approach piston, as it moves on in one differents, will close them one after the other, until ail are closed, and finally, after all are closed, retain in that end of the cylinder a sufficient volume of air to act as a custion whenever the shock or recoil is excessive. During the closing process the pressure of the air in the cylinder is containtly increasing as one after the other the ports are closed, and in most cases of recoil the action never extends to closing all of the purts. This derive operates in both directions, assisting the spring to resist compression and checking the recoils.

The Westinghouse shock absorber may also be included in the pneumatic class. This device was described in a former issue.

#### The Elastic Shackle.

The elastic shackle type of shock absorber, shown in Fig. 4, is made up of two sets of four light weight, helical wire coils. Each pair of helical coiled springs are nested, the smaller inside of the larger, giving the appearance of only two helical coiled springs inside of each housing. Two housings containing these legislates of each shousing spring. They are unade after designs suitable for the various forms of leaf springs, as the elliptic semi-elliptic, three quarter elliptic, platform, etc. By referring to the drawing the reader will readily understand the construction, and eachton of these springs.



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#### Shock Absorber for Automobiles

(Concluded from page 192.) resulng the four nests of helical springs which vibrate so much more rapidly than the leaf springs, and act so promptly that they will bring the pin B back into normal position again before the shock has been felt in the body of the car. This absorber, like all of its type, of which there are several, is a very desirable refinement in automobile aprings, and when properly applied and kept in good order it is a valuable addition to the automobile equip-

The Hydraulic Type.

The shock absorber, shown in Fig. 5, onsists of a hollow cylinder A, the piston H, the washer valve I, with vertical sliding guide e-stops F, the hollow piston rod J containing the adjustable needle valve L for regulating the area of ports K, the combination packing-box-cap B, the eve etling the piston to the chi nel frame of the car and the eye G, for

connecting the cylinder to the axic.

Its action is as follows: Every complete movement of the chassis spring causes the piston to move first rapidly down in the cylinder and then slowly back again to normal load position, or slightly beyond. On the downward movement the oil in the lower end of the cylinder rush up through the large area ports in the piston, raising the valve I and gradually passing up into the chamber above the pis-When the downward movement of the piston ceases the valve I falls, closing the piston ports. The adjustable ports K, always open, have a communatively small area, which prevents the oil above the piston from returning quickly to the lower chamber, thus establishing a pres have in the upper chamber which varies in accordance with the severity of the jounce, and opposes the rapid return of the piston to its normal position, preventing excessive recoil of the spring

Another shock absorber of this type is two cylinders instead of one and is intended to take the place of the spring shackle This absorber may also be placed under class 4, as it combines both the hydraulic and the coll spring principles.

The Rebound Check.
The rebound checking device takes ef-

fect only on the recoil or up-stroke of the springs.

This device as will be seen by refer to Fig. 6, consists of a circular base divid ed in halves, one of which A, is part of the casting forming the clamp containing set screws G, by means of which it is xed to the channel frame of the car The other half B is movable and con talu a sleeve by which it is supported on a stud fastened in the casting A. This a stee is surrounded by a coll spring

C. The two-piece base is encircled
by four colls of fabric belting D
faced with a flexible brass friction band E attached by rivets to the inner end of the belt, and by means of its hooked inner end to the stationary half-base A The outer end of the belt D is looped arou the axie and fastened by the clamp H. The tension is regulated by taking up one or more holes in the lower end of the beit. The coiled belt, circular base, and coil spring are inclosed in a neat metal case which is shown partly cut away to illus

Its action is as follows: As the car springs compress the frame and axle move toward each other, and the coll spring C On the rebound the colled beit tightens and as the coils of beiting slide around over each other they create friction beeen the best D and the brass band E, which is wound around with the beit D in the coil. This friction gradually in-creases as the coils tighten and in most cases of rebound no other resistance is Nicolateff docks, which are of 12,000 tons ance is required, the action continues many is constructing a new type of marine until the two halves of the circular base motor of 8,000 horse-power size. England are forced together against the resistance already possesses boats of the "Envestores"

Pneumatic Tire Spring.
With this device the our rides as it were on pneumatic inner-tube tires without having them come in contact with the road and without the constant liability of punctures and kindred trouble

The accompanying illustration, Fig. 7. was made from a pl otograph of a tourwas made from a photograph of a tour-ing car on which these pneumatic tire springs were tested. To attach this de-vice to a car, the old axie clips are re-moved and the absorber elips substituted. From these clips is suspended a platform on which resis a segment of a pneumat tire containing an inner tube. A fran having a segment of the regulation clincher rim for engaging the tire, rests upon it, and on top of this frame the main semi-elliptic spring rests and is attached to it by the usual clips. Two air plungot visible in the Illustration located below the center of the leaf spring and work in cups formed in the axis clips.

They are provided to tone down a too
rapid action of the device. Each device is provided with the regulation air valve for inflating and deflating the air tube. The pneumatic tire spring shock absorb-

The pneuz er, being of the pneumatic type, really be longs in class 3, but it differs so widely in its construction and operation from any of the others mentioned above that it may be properly placed in a class by Itmelf.

Of the many other devices intended for reducing shock in an autominimum, there are few which diffe any great degree from those aiready described or mentioned, while there is probably none which differs in principle of

#### The Heavens in September

(Concluded from page 187.) the beginning, and 10:30 P. M. at the end of September. As the Earth overtakes him, he grows steadily brighter, and now he appears about equal to Procyon, though only one fifth as bright as he will seem at the end of the year.

Jupiter is on the opposite side of the heavens, and very far south, so that, though not yet in quadrature, he sets about 10:30 P. M. in the middle of the

Saturn is almost stationary in the w ern part of Taurus, and appears very like Capella, both in color and brightness. He is in quadrature with the Sun on the 10th. then Mars.

Uranus, which is in Capricornus (as described recently), remains above the horizon till about 1 A. M., but is best ob-

norman till about I A. M., but is best ob-servable in the evening. Neptune, in Gemini, rises about the same time that Uranus sets.

The Moon is in her first quarter at 8 A. M. on the 7th, full at 8 A. M. on the 15th, in her last quarter at 7 A. M or the 23rd, and new at midnight.on the 2 She is nearest us on the 1st, farthest away on the 15th, and nearest again on the 29th, when, from the coincidence of new moon and perigee, we may expect very high tides.

During the month she passes near Jupi-ter on the 9th, Uranus on the 11th, Saturn on the 22ud, Mars on the 23rd, Neptune on the 25th, Venus on the 27th, and h cury on the 30th. The conjunction with venus, which occurs about •4 P. M., is close, but both bodies are low in the west, under the Sun, and almost unobservable.

#### Gas-driven Russian Ships

THAT internal combustion engines of increasing size are being used for vessels in various parts of Europe is shown by the fact that the Russian navy is now engaged in building two ve seeded. However, when greater resist- draught. On the other hand, the German are correct together against the resistance already possesses notate of the analysis of the coll spring? Acting at all times in exact proportion to the severity of the loops-power, and js going into the consistence of the proportion of the severity of the loops-power, and js going into the consistence of the proportion of the proporti PATERT ATTERNEYS



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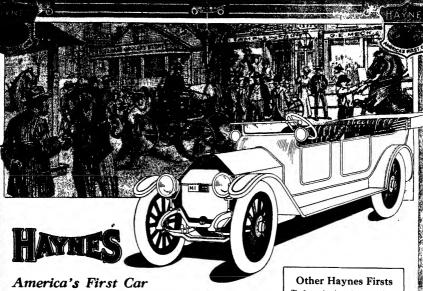
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Inspiry No. 3911. Was is much and address of true who could make a machine for various of the button. The peachine must be empaided or main the dough of the enact eith required, and also machine to manufacture to ma 



scores another big First

Ever since Elwood Haynes created America's first gasoline car, and drove it down the streets of Kokomo, two decades ago, the Haynes has been constantly a pioneer and pace-maker in developing the automobile and bringing it to its present state of perfection.

In the panel at the right, is a long list of Haynes firstsand now the Haynes again comes to the frontThe first gasoline-driven American-made car

The first two-evlinder opposed motor car The first user of alumnum ut crank case

The first to use makel steel in axles,

The first side door car

The first to use throttling carbureton

The first to use make and break spark. The first to use the jump spark.

The first to use electric genetion

The first to use a magneto.

The first to use the double independent system of ignition, through two sets of

Write for "The Complete Motorist," a Wonderful

automobile book

By Elwood Hayne In this book, Mr. Haynes, the creator of

the first American car, tells you the impor-tant things to know about an automobile, tells

you what the different parts are for and what

# All New Haynes Models

# have Vulcan electric gear shift as standard equipment

The Electric Gear Shift completes the electrical equipment of the Haynes. It is started by electricity, lighted by electricity and the gears are shifted by electricity. This wonderful invention puts an end to the pulling of gear levers. You sit erect, your hands never need to leave the steering wheel. Your eyes can always be fixed on the road ahead. Safety and confidence is gained as well as absolute ease and convenience—to say nothing of the satisfaction and pride in possessing the very latest of automobile betterments.

#### Many other good features

Mechanical tire pump, pressure feed gaso-line supply; complete dash board equipment as specifications show, rain vision; ventilating wind shield, wide doors and roomy tonneau; deep cushions, curtains adjustable from the seat, good-sized package space under both front and rear seats, and many other advantages-

# Beautiful-strong mechanically

The lines of the new Havnes models are long, sweeping and very pleasing Back of

Model 26. Weight 3800 lbs.; 6-cylinder, 65 H.P., 130-inch wheel base, 2-passenger roadster, 4-passenger straight-line, or 5-passenger touring car, \$2700; coupe, \$3200.

the beauty, the convenience and the com-fort of the Haynes, is a simplicity, stur-diness and reliability that is the finished result of twenty years of testing and prov-

#### See the new Haynes models at your dealers

The Haynes with the wonderful gear-shift is being exhibited and demonstrated by a dealer near you If you don't know who he is, let us tell you.

you should know about them; tells how to run an automobile so as to get the most en joyment for the least expense. Write today Model 27. Weight, 4000 lbs.; 6-cylinder, 65 H.P., 136-inch wheel base, 6-passenger straight-line, or 7-passenger touring car, \$2785; limousine, \$3850.

Model 28. Weight, 3400 lbs; 4-cylinder, 65 H.P., 130-inch wheel base, 2-passenger roadster, 4-passenger straight-line, 5-passenger ring car, \$1985; coupe, \$2700.

The Haynes Automobile Co.

46 Main Street

Kokomo, Indiana



#### RECENTLY PATENTED INVENTIONS

These columns are open to all patentees. The notices are inserted by special arrangement with the inventors. Terms on application to the Advertising Department of the Schmylyc AMPRICAN

#### Pertaining to Apparel.

OVERNHOR — M. H. Strom, 923 Whitlook Ave. Brons, N. Y. N. Y. This investor provides an oversine which may be folded for transportation or storage; construct an oversion from non-ideatic natterial and in such above the strong of the strong o

#### Partaining to Aviation.

Pertaining to Aviation.
AVIATION APPARATIRA—T W CAREY,
JR 800 (wast Sirvet, New Orlans, Ia The
potting of the second of the Investion is to provide an apparatus for training new aviations
one superposed above the other, upon which
a pair of trolleys run. Between the trolleys,
the accoplane is supported into all new in which
dispers of solid place is to the second of the control of the contro

#### Electrical Devices,

Electrical Devices.

NWIVEL JOINT FOR RECTRIC CONHUCTORS—C. TRINING 36 Leonard Street,
New York, N. Y. The Investion provides a simple and improved construction of server joints whereby a portion of the conductor may be turned relatively to the other without en-traplement. This result is encomplished with very few parts, reducing the east of manufac-ture to a military.

time to a minimum IRENT TOPISTA —C. W. Foun, care of Will-lanes Street Instry. Findist, Ohlo. The In-provement in this heet topic condists in the provision of mechanism for supporting a series of bests singuished one another and with the tops extending in one direction and for mov-ing the levis in succession besset in stepping mechanism that will remove the tops. The mechanism is arranged to be drawn through

the field
COTTON CLEANER AND SEPARATOR—
S F KEITY, BOX 1007, Attenta, 6a. In order
to open completely the belts of cortion and detech and separately discharge the cotton Borsopened bolls through the machine, Mr. Kringe
has larvated a unachine witch employs a so,
tion chamber provided within with a mean for
ireading the bulls of cotton, and separating
and discharging the filters.

#### Of Interest to Parmers,

Of Interest to Parmers.

RERT TOPPER OR CROWNER J. B.
DAWNON, P. O Into 67, Pompers Filler, Must.

Pala automatically operated device is attached
attached to the control of the control o

grain.
FERTILIZER IDSTRIBUTER J S DONGAN, Lemonrove Cal This invention is more
particularly intended for calculations in more
tillier distributor capacitally adapted for or
bard use. An object is to construct un implement having improved adjusting means whereby to ran the implement to aw desired depth

#### Of General Interest.

Of General Bucress.

COMPONITION OF MATTER — J. B. GII.
REAT, Knowlife, Pa. This invention relates
to composition of matter, more particularly
compounds for preservation of soles of shoes
The sim is to provide a composition which can
be made from incepenies materials. The
leather to made sweeppoof without destroying its publishing

list its pilability
FIDITA AND FLOWER CITTER—C F
BILLAI, 1430 Second Ave, Cedar Rapida This
devire is adapted to be phered on the flager,
the body member of which is made of resilient
material and of spiral conformation, and having a longitudinally extending bearing por
tion against which the flager may enagare
when the device is in use thereby providing
for more secure binding of the device on the for more secure but finger at such time.

OVERSHOE FOR HORSES—C R Cham, 258 W 22nd Nt., Manhattan, N Y., N Y The Inventor's nbject is to provide an overshoe, the tread portions of which may be readily replaced when worn or when a different character of tread is desired, further, to provide an

overshoe in which the hoof-supporting an structure with contact with the hard fi portion unity of the hoof.

portion may of the hoof.

APPARATE FOR SUILDING FOUNDATIONN AND WALLS,—G. F. MILLS, Cettarhill, Fla. The object here is to provide an
apparatos having forms, spaced spart, between
which the rocecter may be deposited, a brucket
being connected with one of the forms for
concrete is deposited, there being means for
concrete is deposited, there being means for
rouns.

rating the forms and the bracket simultaneously
METHOD FOR CONCENTRATION OF
ORISON—0.1. ADARS, Orand Junction. Volo.
In mining for care metals, seed as avadelineterminated in the seed of the seed

tougue, adapted to spress the filed papers against lib back

SYTOID;—4 B McKINWER, Barry, Hi. The invention relates to stook for use by destrict of the invention relates to stook for use by destrict of this characteristic papers and the properties of the class which comprises a mitchly formed seat and the munuting for the seat which per mits the same to be putility and facility adjusted in any direction. Means for readily adjusted in any direction. Means for readily should be supported by the same to be putility and facility and the same to be used in Router and the store in sets of various sizes in this same of the same of sizes in the same of t

# for a two unit furnace, disposing of from 10 30 tons of garbage per day.

Hardware and Tools.

CABLE CLAMP. G. R. EDURLBUTTER,
Helmers, B. P. D. No. S. Bellingsham, Wash.
The object in this finishnes is to provide a simple and comparatively inexpensive derice which passesses strength and durability and which will safely and referritely damps a cube and provided the same from slipping in any direction.

CLASP .-- A O BOLLAND, 1218 L St., Aurora

NOTIONS — A O BRILARD, \$218 F. Rt., Astron.
Neb The Institution here is to provide a sin
pile and inexpendive clasp autathé for use,
whenever II is destrable to firmly hold two
flat elements together, which may be adjusted
in accordance with the thickness of the anistate of the second of the second of the second of the
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tion which make a part of the key TONGH-N PLRASON, (upona, Wisconsin The Invention provides tongs adapted far beg ging and the like in which the leg and the application of the leg and the provided provided the leg and leg

#### Heating and Lighting.

Heating and Lighting.

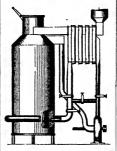
OVENIBACE—B 8 ALMS, 517 W 184th
8t, New York, This rack is so arranged that
it may be drawp partly out of the oven for
conveniently placing a pan of food upon it and
for inspecting the food of for basting it. The
rack is collapsible and may be conveniently
stored in a bindiumn of space. It is adjust
able to fit different stend oven

able to fit different stand ovens
Lightfung PixTurRe—J. T. Rona, care of
Mitchell, Vance & Company, 507 West 24th
Street, jew Foxt The fatture is particularly
adapted for use in hospitals or sick rooms, being provided with a bracket which may readily
is attached to the handboard of a bed The
bracket is steaded with a range whose jaws
may be made to grip either a rectangular or
curred surface.

VAPOR LAMP .-- W. LIEDER, BOTH

pilo mai mai mai pilo vaive

were the main against The centring of the pilot fame is accomplished by a thermostatic vaire. BCONOMIZER.—L. L. Gonz, Box 285. Marshibid, Oregon. Among the principal piets which this investion has in view are: To provide a system for supplying to a furness cupils afr which has been heated by assured the property of the provides are the provides are within the provides are the provides and the provides are the provides and the provides are the provides are the provides and the provides are the



gases so as to separate any escaping mineral or liquid matter held in suspensium, to pro-vide means for cleaning the apparatus; and to provide an apparatus which may be rx panded or contracted at will.

Machines and Mechanical Bevices,
MACHINE POIM MAKING PAPER BAGE,
F. Hiert, Tempeluir, near Beelin, Germany
The machine is designed to make fist bags of loth rectangular and triangular form The hisabs, after they have been folded are con-voyed at an angic depending on the form of the lags, to the apparatus for footing their lags the blanks are being morel continuously
the blanks are being morel continuously

While the laps are being footled and stuck the blanks are being moved continuously WEILL-CAMING PERFORM AT OR.—A. Connawa, 311. Cherokee R., Barthweille, Okan The prevent invention is an improvement on the continuous of the continuous of the continuous of the continuous of the class in which body perforate ing wheels are used to produce a plurality of rows of perforation longitudinally on the well cashing, during movement of the perforator in medical continuous districtions of the perforator in the continuous distriction of the perforator in the continuous distriction. Anti-friction derives are need to perform the continuous distriction of the perforator in the perforator when the continuous acting develoing mechanism which may be supported upon any of the usual vessels and which will exceed to the continuous develoing the continuous

the was bottom.

HGH PURSENINE VALVE—J. Lasses,
boars, Jersey City, N. J., and L. Exco, New
York, N. Y. Address care of Janeph Langdorff & Co., 314 E Zist St., New York, N. Y.
operation of the Company of the Company of the Company
provide a valve which will be maintained in
thoose position through the aid of a spring,
mastered by the pressure of the full passing
through the valve, opening of the valve being
through the valve, opening of the valve being
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irought about through coupersulon of the spring.

RECIPROCATINI SCOOP DRAG.—L. W. SACERT. Ascissoriils, Fig. The invention has been also been also

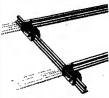
ALTHING DEVICE.—W. W. PALKER, BOX 88 Tottenville, S I., New York, N. Y. This investion has particular reference to wood-working apparatus for use in applying com-mon inthe in building construction. Through

the test of the decision of latter unit was a second properly spaced, second of studding, whether the studding, whether the second seco

Prime Mewers and Their Ace ROTARY BNGINES.—1. P. Nava-Rot 1.687, Butts, Mestana. This since is provided with a cylindrical covered with wire wool fitting ann the casting in which the cylindrical adapted to rotate. The Suid direct the instited wire wool, may expand o in the openings in the wool.

Maliways and Their Accessories.

RAILWAY CHORN TIE.—R. H. PINKHAM,
Derry, Westmoreland County, Pa. This invention has for its object the construction of
cross-ties in such a manner as to utilize old

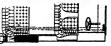


RAII WAY CROSS-TIE EMPLOYING OLD E

or iliscarded fragments of running ratio se that they will constitute the principal portion of cross-ties. The invention covers certain cushioning devices, and special means for se-curing the cushioning device to the raii.

#### Pertaining to Vehicles.

SIGNALING DEVICE,—M. J. Manust-naum, 332 West 145th St., New York. An im-proved signalling device in here provided for use on automobiles whereby the chanfleur may display a ternout aign or a step sign by day



SIGNALLING DEVICE FOR AUTOMOBILES

or night, and also sound an starm. The signs referred to are normally retained in a com-partment, but may be awang sidewise into view when desired.

view when desired.

SIEID ATTACHMENT FOR AUTOMOBILE—F. F. Stania, St. Francis, Maise,
The invention provides a side and propelling
machanism therefor attachable to standard
makes of automobiles without altering the car
inher than to remove the whoels. Proputsion
is accured by means of chain fitted with
spikes and driven through snitzble chain and
sprocket gearing from the rear saile of the eat.

Beelgma.

DENIGN FOR CAPET OR RUG.-E. W.
Taix, care of Baatta Maunfacturing Com
pany, lattic Falla, New Jersey. The patent
covers a flowered design, the main body of
which consists of flowered squares, about which
is an elaborate border of conventional leaves
and flowers.

NOTH.—Copies of any of these patents still be furnished by the SCHETIFIC AMERICAN for the centre each. Please state the mame of the patents, ditle of the invention, and date of this paper.

We wish so call attention to the fact we are in a position to rander compensate view is every branch of patent or trade-work. Our wist is composed of mechan-cetrical and chessical experts, theron traifed to prepare and presecute all pa-terior of the subject matter any of the of the subject matter any of the subject and called, technical, or actentific knowledge entered the compensation of the subject and the con-

ciclised, technical, or measurement of the distribution of the distribution of pairs and trade-mask applications filed in all of A Co.

# Tempered Blades Temper is the thing ulahes Keen Kutter safety razors and knives—temper that lasts. Of course, the steel is good; that tells in the temper. The design is right; finish is superb. Altogether, these are the qual-Cutlery The name "KeenKutter" about it. Only the finest shout it. Only the finest swellin treel goes in Keen Kutter Editor (College of the college of You'll never have cause to fuse and fret with a Keen Kutter safety razor or pocket knife. But if you do, the dealer will return your money without question. That's the Keen S EARDWARK CO., Inc

#### Intra-countel Canal System for the Atlantic Seaboard (Concluded from page 186.)

The state of the s

the need for a completely sheltered waterway between Narraganaset Bay and Boston should receive further consideration. He was of the opinion that, after the conpletion of the Cape Cod Canal, the quetion of its acquirement by the Government, based upon its value as a going concern, might be worthy of further conaderation.

Waterway is what is known as the Narsett Bay-Long Island section. This route leaves Narragansett Bay at Bissel's Cove, and follows a series of tidal stream and lagoons to Long Island Sound, oppo site Montauk Point—one object of this diversion being to avoid the dangers of navigation around point Judith. The ganal 18 feet deep would cost \$11,300,205 and that one 25 feet would cost \$24.-736.635. The Special Board was favorable to the construction of the smaller canal; but the Board of Engineers of Rivers and Harbors differed from them believing that the canal afforded prac-tically no saving in distance over the out-side route, and that boats would probably prefer the latter, except in stormy weather They designated this as the "least-needed link" in the whole scheme. The chief of augmeers concurred with this view of the Board of Eugmeers, be lieving that the full benefit to be derived from the construction of a canal 18 feet deep could be obtained only on the com-pletion of the sections of the waterway to the south

The SCIENTIFIC AMERICAN is of the opinion that on the completion of the Cape Cod Canal, the protection afforded by Cape Cod Bay, Buzzard's Bay, and Loss bland Sound will be sufficient to meet the commercial necessities of the situation for many years to come.

New York—Delaware Canal.

Although the report of the Army Engineers is unfavorable to the construction of that part of the intra-coastal canal New York Harbor, they favor the con-struction by the Federal Government of the proposed waterway extending from New York to Beaufort. Regarding the New York Bay-Delaware River section, Special Board found that it would be inadvisable to purchase the existing Delaware and Baritan Canal, and they recommended that n new sea-level canal with a depth of 25 feet, connecting Barltan Bay with the Delaware at Treaton, be constructed at an estimated cost of \$45,000,000. The General Board, how ever, considered it improbable that the ercial benefits of a 25-foot sea-level canal 72 miles to length would warrant the large expenditure. They cludwed that, for the expected traffic of 5,600,000 tons, such a canal would show no advantage over a double-track freight railroad. The Board argued that, since the principal estimates for a saving by this route were based on calculations for one thousand and two thousand ton barges, and since either of these can be accommodated on n depth of 12 feet, it would be advisable for the present to build a canal of that

General Bitsby in bis report of August, 3918, recommends the construction of a lock causal, 12 feet deep and 90 feet wide, from New York Harbor to the Delaward Hiver, at a total cost of \$20,000,000. He suggests that it be no built as to provide for an economical enlargement to a depth of 25 feet, and for its outliness excession to see level. Bakes no Bitsby Character Bits See Section 12 feet of the section o

for its utilimite excavation to sen level. Delaware River-Cheaspask Bay Section. After examining all practicular routes in the section from the Delaware River to Cheanpeake Bay, the Special Board selected and surveyed a route along the line of the present Cheanpeake and Delaware Canal, which routhow from Delaware city on the river of that name, to Cheanpeake city at the head of Cheanpeake Bay. This examination showed that a quant 23 feet feets, along this route, would cost to build continued to the control of feets, along this route, would cost to build control of the control





# Notes and Queries:

Mindly keep your queries on separate sheets of paper when corresponding about such matters as patents, subscriptions, books, etc. This will greatly facilitate answering your questions, as in many cases they have to be referred to expects. The full name and address should be given on every sheet. No attention will be paid to unaspeed queries. Fell hints to correspondents are prated from time to time and will be mailed on request.

matter as paternia, subscriptions, books, etc.

This will greatly facilitate answering your questions, as in many cases through have to be referred to experts. The full mane and address should be grown on every sheet. No attention will be paid to unagend queries. Fell hints to correspondents see printed from time to time and will be mained on request.

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(12844) W. W. S. asks: As we are subscribes of long standing to the flocus reverse the crews of vessels a dispute in the second state to dried, it is not all use a "porceas" and the water becomes much nooler than the subscribes of the flow of the control review and the water becomes much nooler than the surrounding atmosphere. It shill be after on the time the same way to the control review and the surrounding atmosphere to the flow the control review of the same water to come through and be ownperstand the provision of the same way to the same way to be made to the provision of the water ones in part from the state theat, which that becomes in part from the state theat, which that becomes the provision of the provision of the same way. The reason why a hot day with a same way the same way to be deviced to be the fire we continued to the same way. The reason why a hot day with a same way the house of the provision of the same way. The reason why a hot day with a same way the the humidity is low than when the humidity is low than when the humidity is low with the humidity is low with the same way the same w

YELDBOOK OF THE EMPES GRACUS De-FARTMENT OF AGRICULTURE. 1912. Washington: Government Printing Of-fice, 1913. 8vo.; 781 pp.; illustrated. 

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APPLY Multipole for preventing Occupation will be a lost to be conwork added visic as a test book

SAFRYY. Multipole for Preventing Occupation will be considered as a liveage
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Leonard B. Kendall. New York: Harper & Brothers, 1913. 89, vo; 422 pp;
illustrated. Price, 25 net.

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BULLETIN OF THE BURBAU OF FIBERRIES. Vol. XXXI. 1911. A Biological Survey of the Waters of Woods Hold and Visinity. In Two Parts. 8vo.; 860 pp.; with charts and maps. Washing-ton: Government Printing Office, 1913. tion: Government Printing Office, 1913. Part I of this lesse of the Bureau of Flabrice Is divided into two sections, the first desiling with physical and sociolectal superior, the second with botanical Part II also has two sections, the tended of the second a catalogue of the marine flors. It is postated out that fauntates and floristic studies are justified to both from scientifies and practical points of view, and the thoroughness of investigation shows My our Government reports in continuous studies above My our Government reports in facilities, commends this survey to all naturalists.

describes a spiral around the shireral path of the sum. A disconsist of this topic map be found in Young a Manual of Astronomy, which we send for \$5.00 [precise as which we want for \$5.00 [precise as which we will be a proceeding force (128/50) M. A. C. asker: Can you give force the body or machine with the vote of the body or machine with the you with all which has been secondated for which the stablest to the time of the policies of the subject to the time of the publication of the subject to the time of the publication of the revariance gives the subject to the time of the various typin of machines of the significance without the publication of the various typin of machines of the significance without the subject to the time of the various typin of machines of the significance without the subject to the time of the various typin of machines of the significance without the subject to the time of the various typin of machines of the significance with the subject to the time of the various typin of machines of the significance with the subject to the time of the various typin of machines of the significance with the subject to the time of the various typin of machines of the significance with the subject to the time of the various typin of machines of the significance with the subject to the significance with the subject to the significance with the subject to the time of the significance with the subject to the significance with the su

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A Morse Fine-room Size Services Courses Rose. Proceeds Subsection of Roomonies and Rodering Compression, with Complete Fines and Services Andel Building, St. vis. A. Himmelweight, M. Am. Son. C. Son. Over. The Name Fubblished Company, 1918. Others 46s., 72 pp.; 26 full plans. Price, 31.

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and experts make the report of the Optical
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A POPULAR DICTIONARY OF BOTANICAL

NAMES AND TERMA. WITH Their Engangerical and applications by George Production and Market and Production and Market and American Average Production and American Average Production and American Average Ave

tion to specific name than is ordinarity the case. Hence, those who are unrainitier with classical Rence those who are unrainitier with classical Rence the who are unrainitier with classical Representation of the Postchild. Lass Souncians are Inverse Procedure. La Baguette, le Pendule. Par Henri Magner, Ingestieur-conseil en Hydrologie Sounciarraine. H. Dunnd ot E. Pinatt, Paris: Soliculitie Europe's interest in the divining the state of the Pendule Rence Processor of studying the phenomena of the divining red. In France the subject has provided so much discussion that some very slaborate apperiments of the Pendule Rench Rence Processor of studying the phenomena of the divining red. In France the subject has provided so made discussion that some very slaborate apperiments of the Pendule Rench Rench



Deptie T. M. C. A.

# Most Beautiful Interior **Finishes**

Modern science has now made it possible to easily produce the most beautiful sterior effects in a finish that is also fadeless, durable and economical, by the use of



This is the only true Mellotone. It produces the soft, pleasing effects required in artistic decoration, is washable and fadeless, and lasts for years, making it more economical than other finishes. Black, white and fourteen colors. Send for Mellotone book and sample color cards.

For factory and wareroom interiors there is nothing more desirable than

### Lowe Brothers Mill White

It spreads freely, works fast and has great covering and binding power. You can whiten and brighten your walls even though they are dark with dust and smoke. Lowe Brothers Mill White has a great lightreflecting power, adheres to any dry surface, and may be had in either gloss or flat finish.

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Experts have prepared our cappers have prepared uniteresting books on these and other "High Standard" products which will be sent free on re-quest. These's a Lowe Prothers Paint, Vannish, Easted or Stain for every purpose. Write today, appendictioning the leind of finish you didno participative internated in.



80290,230 and the Board receivisheded that the Chesipseke and Delaware Canal should be acquired by purchase of 20,514, 284. This oanal is ten feet deep and is at the lock trop, the locks being 26 feet wide by 200 feet long. It was suggested that the change to 12 feet be made grad-ually, and in such way as to interfere as little as possible with existing traffic. General Bixby, in his recommendation made to Congress this month advises

made to Congress this month, advises that the Government should purchase the existing Chesapeake and Delaware Canai connecting the Chesapeake and Delaware Bays, at a cost not exceeding \$2,514,298. He further recommends the expenditure of approximately \$8,000,000 by the Gov ment in transforming this canal fro a lock canal into a sea-level canal with a depth of 12 feet throughout and a ninety-foot width at the bottom-the deepen ing of this canal to 25 feet being post poned until after the effect of the nev 12-foot canal on commerce is apparent
Norfolk-Beaufort Inlet Section.

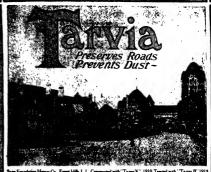
After examining all practical routes of the section from Norfolk to Beaufort, the Army Engineers selected and surveyed as marie and Chesapeake Canal, Currituck marie and Chesapeake Canal, Currituck Sound, Alligator River, Rose Bay, and Adams Queek. The plan was prepared for a canal having a depth of 12 feet and minimum bottom of 90 feet. It was recommended by the Special Board and approved by the Board of Engineers and the Uhief of Engineers, that the existing Albemarle and Chesapeake Canai should be purchased for \$500,000, and that \$2,235, on purchased for convoy, and that \$2,230.000 be spent for its improvement and the increase to a depth of 12 feet. The route from Albemarle Sound to Pamileo by way of Rose Bay was estimated to cost \$2, 215,000, the Brant Shoal cut would cost \$55,000 to remove, and the section of canal from Paulico Sound to Beaufort inlet via Adams Creek Canal was estimated to cost \$395,000. The estimated cost of con-struction of the whole section, exclusive of the purchase of the Albemarie and Chesa peake Canai, was \$5,400,000. Congress last year made a start in the construction of the Inter-coastal Waterways by ap-propriating \$400,000 for this Norfolk Beaufort section, \$500,000 of this amount to be expended in the purchase of the Albemarle and Chesapeake Causi, the bala to go toward active construction.

Existing Conditions.

The situation then with regard to the porposed inter-coastal Waterway, is that the section from Boston to New York is the section from Boston to New York is abandoned; that the Chief of Engineers has recommended that Congress appro-priate \$30,000,000 for the construction of printe explosion for the construction of a 12-foot canal between New York and Norfolk; and that the 12-foot canal from Norfolk to Beaufort, as we have said, has been authorised by Congress and is now under construction.

#### Life Without Microbes

THE possibility of animal life under conditions quite free from microbes is occupying the attention of experiment-ers, and the Paris scientist Guyenot uses the common fly for this purpose (Droso phila ampelophila) obtaining their reproduction and following their descendants. He now possesses a collection of speci-mens dating from two years past and comprising a great number of generation Development from the egg to the image, at 24 deg. Cent., lasts for twelve days. and the femates commence to lay on the first and second days after hatching. In this way be obtains two generations a this way be obtains two generations a month and each generation contains at least 10,000 files. The line followed by him since May, 1911, includes some 40 generations or 400,000 specimens. Under these conditions, living in a medium free from microbes and feeding upon specially prepared food, the specimens do not show prepared food, the specimens do not show any leasoning to attempt of fecundity. But ou the contrary their development taking place under exceptional conditions which are not found in nature. Wille in this critisary case the increatity during de-velopment in when great for have and rouns at its semediatity making in the pre-



# **Dust is Expensive**

WHEN an automobile speeds While I an automobile speeds down an ordinary macadam road it leaves in its wake a cloud of dust which is carried by the winds over the neighboring fields, houses

over the neighboring fields, houses and lawns.

This is just as surely a waste of good material as if the automobilist dug material out of the highway and carted if away. Dust represents waste—cody waste—and the taxpayers feel the result. A road that is properly built for modern traffic will not be dusty.

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#### Automobile and Improved Roads (Concluded from page 178.)

tions which are most carefully laid in one course and some of which have been given a paint coat of bituminous materiat; and fourteen sections of brick pavement laid on six inches of concrete with as many varieties of modern paving brick. Preliminary measurements of all quantities have been made on this work, and a very careful traffic census is now kept.

#### The Natural Sell Read and Its Possibili

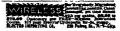
Curlously enough we are forced to admit there is a possibility that the natural soil road will play an important part in the future. The natural soil road well drained and crowned is a most comfortable road during a large part of the year.
Will it not be economical to give the earth d gravel road a thorough trial? In the past gravel and earth roads have not been past gravel and earth roads have not been scientifically cared for. It is now known that, with persistent drugging, natural soil roads may be kept in splendid condi-tion except in the very worst weather. It has not yet been demonstrated that an earth road built with the same care for grading, silgament and drainage strucat would be given to a bituminous macadam road, or a brick road, may not. macadam road, or a brick road, may not, after all, be a very economical type of road if properly maintained. If traffic on such a road develops in the future, there will be an excellent foundation for a superior surface. One reason that natural soil roads have not been considered by modern highway engineers is because such roads have never been maintained with sufficient continuity and care to demonstrate what they can do. There is no doubt that a well-built sand-clay road, where the materials are carefully selected, is a most excellent highway. It will stand up under considerable traffic, and is very comfortable for automobiling. Of course, such a road must be maintained by skilled labor continuously. The most economical method of annual

or skined abor continuously. The most eventuation in the hold of annual maintenance of our bituminous bound macadam roads has not been finally determined. Last year and this year saw the first scartifying of old bituminous bound roads to any extent. From now on, there will begin to supear the necessity for resurfacing bituminous macadam highways, as some of the first roads so built are now seven or eight years old. Evidence presented at the international Road Congress in London, tends to show that high carbon tar products used for the superficial coat upon highways, tend to become weathered and are less waterproof than some of the asphaltite oils. This eridence however is not conclusive. Over a great many miles of bituminous macadam State roads in New England, a very light cost of oil has been applied twice a sosson where automobile traffic wheevy. The oil has been put on regardless of the dust, and forms a soft, loose layer of oil and loose of layer of oil and forms a soft, loose layer of oil and loose of layer of oil and

#### Automobile Economics and Good Roads

When it comes to the economic benoft of the automobile, we face a problem comparable to the problem of the value of railroad transportation. The movement of passenger coaches is not always of direct economic value, and yet such transportation is an absolutely mecessary feature of our modern life. It is quite common to hear it stated that the automobile is a pleasure vehicle. In the beginning of the automobile movement, the pleasure travel was doubtless very large, but it is certainly not true to-day that motor vehicles other thau trucks are all pleasure vehicles. A large number of them are used for business purposes, in the same sense that the railroad car is so used. There has been an extensive readjustment of land values in many parts of the capture of the suppose of the subject to the subject of the suppose.







who went to make yarly good pletures—one who have found that they next to themselves justing with an archivery less—should other treat in photography, solds all the obscures in their lever, by leaving their assertate from with a

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and, speed in travel all over the co (17) has have dumness development. Of course, no one denies that a large part of automobile travel is still purely for recreation and enjoyment. The need of organized recreation and enjoyment for the more densely populated areas of this country cannot be denied. The automobile count of highways is merely an incident which indicates the directions in which our people are willing to increase their

Perhaps of more direct ec ee than any item which has yet appeared is the increasing use of the aut mobile truck in farming operations. A ples are hauled by motor truck in Virginia and Oregon, cotton in Mississippi, potatoes in Maine, and so on. The possibilities of increasing the service of motor trucks in collecting cream, transporting perish able fruits, and kindred operations are im mense. When the use of such trucks be comes common, the construction of roads will have reached a more scientific stage than ever before because the demand for such service will be exacting. While thinking on these matters it must be re membered that progress in the economic development of transportation and distri-bution methods is an essential and inevitable feature of our modern life.

The Third American Road Congress which occurs in Detroit, September 29 to October 4, inclusive, will have one section devoted entirely to the discussion of the technical features of highway engineer ing. As there will be present at this gath ering most of the highway commission of the States actively engaged in road building, there should result from the meeting many valuable conclusions as to the present stage of construction and metutanence

#### The Winnipeg Tractor Trials Sixth Annual Event Shows Farm

Ready for General-purpose

Engines

By L. W. Ellis

THE sixth annual farm tractor compe-tition held recently at Winnings brought out the fact that, even in the vast prairie provinces of Western Canada, boti farmers and manufacturers have satisfied elves of the efficiency and economy of the larger, standard type of tractor and are now more keenly interested in the medium to small tractor for general work

A glance backward over the six cur-ests shows a marvelously rapid evolution of the modern tractor from the experi-mental to the every-day stage. The present year's trials seemed to prove that from the psymiar standpoint, at least, the element of uncertainty was so lacking as to result in an almost complete iapse of interest. As if by common consent, farmers and manufacturers suddenly withdres their support, and the competition am only three firms had more of a technical than a popular significance.

The first contest, in 1908, was an ternal-combustion tractors only, the weight limit of seven tous barring practiculty everything in the way of a steam engine. The very large gullery that watched the hauling and plowing trials had quite as much interest in seeing whether all the tractors would fluish the tests as in the comparative scores. Their viewpoint was substantiat, for only six out of seven finished, and nearly all had difficulties that would have proved serious in actual practice.

After 1908, steam tractors were and for two years the battle was between the ponderous old steam engine and the lighter internal combustion rivats which had sprung up thickly and with growing satisfaction to the trade. The introducon of a friction brake as a substitute for 1. 16. SHOOK ABSORBER CO., Inc.

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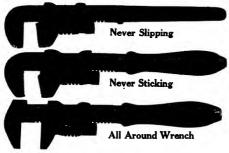
This new Winchester is the lightest, strongest and handsomest repeating shotgun made. It weighs only about 51/4 pounds, yet it has surpassing strength, as all the metal parts are made of Nickel steel, having about 50,000 pounds more tensile strength to the square inch than ordinary steel. The receiver is free from screws and unsightly pins to collect rust and dirt and work loose, and its solid breech, closed at the rear, makes it extremely safe. It operates and works with an ease and smoothness not found in similar guns of other makes. It is simple to load and unload, easy to take down, being separated into two parts quickly without tools. For pattern and penetration, it is fully up to the established Winchester standard of shooting quality, which has no superior.

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FOREIGN PATENTS VALUABLE

All communications with this company and for foreign patents of this marvelous tool should be addressed to the inventors, C. F. and C. G. Youngquist, 442 ½ Washington Street, Pertland, Oregon.



steam tractors lay help

the scenn tractors lay nemies for want of water wishin sight of a large, modern city, was not without its effect. The combatants became the advocates of gasoline and karosene, respectively sene entry in 1910, the nun From one revenue entry in 1910, the inter-ber became eight in 1911. A year later kerosene—the cheap fuel—won the fight, fust as gasoline, the labor-saver, had first won over coal. Higher engineering effisiency in the gasoline tract prevail against the practical commercial odds that placed a handicap of nine cents a gallon—27 to 30 cents an acre—against ratory skill.

With these contests decided, and both kerosene and gasoline tractors growing in reliability to the satisfaction of the customer, the five-to-one ratio of internal stion to steam tractors for plowing now seem to make further contests up necessary for settling the broader, general questions. The decision as to the merits of particular makes of machine is ever one that must be settled on its merits for each locality, and even each form, by itself, owing to the great variety in type and adaptability of model offered the public

Press and public had turned their tion to the one great question remaining comparison of the tractor with the mained practically the same this year and promised no new light upon the ques-tion of the hour. The busy manufacturer and the blass farmer stayed at home, a three competitors, with the usual attend of technical representatives, had the field to themselves. These were the J. l. Case Threshing Machine Company, Ra-cine, Wis.; Avery Company, Peoris, Ill; and Sawyer-Massey Company, Toronto Canada; Rumely; International Harvest Emerson-Brantingham: Kinnard-Shapely and Muir; Marshall; and other ormer contestants, dropped ont and, for the most part, contented themselves with

the most part, contented themselves with displays at the exhibition proper. As usual, many new models appeared. From the inside, the competition was well conducted. The Canadian Industrial Exhibition, the sponsors, provided satisfactory facilities, and the conduct of the conduction test by members of the American Society cultural Engineers, acting as such, high order Prof. L. W. Chase of was of high order was of high order Prof. L. W. Chase of the University of Nebraska, acted as engi-neer-in-charge. The judges were Prof. J. B. Davidson of Iowa State College, Prof. L. J. Smith of Manitoba Agricultural Coliege, and Prof. H. W. Riley of Cornell University, former president of the so-Each of those centlemen heads a ment of farm engineering, and the corps of observers was composed of advanced students in agricultural engineer-ing from the Manitoba institution, each one with the advantage of at least one year's motor contest experience. As a result, the data obtained are unusually complete and reliable, easily outranking those taken at any of the European trials which are being held with greater fre quency each year.

The basis of competition was practic ally unchanged from that of other years except that definite, previously annous penalties were set for definite faults. Two competitors, each having entries in the same two classes, exchanged first prize gold medals as a result of penalties, without either losing an honor, but otherwise the deductions did not affect the relative standings. The tests consisted as usual of four phases:

(a) A two-hour economy brake test for ny of fuel and water, steadiness of g. absence of mechanical trouble or running, absence of mec excessive inbrication, etc.

(b) A half-hour maximum brake test immediately following, to determine the highest feasible power output, i. e., without excessive consumption of supplies, vibration, heating of bearings, lubrication, or other difficulty, and without increasing ne speed.

(c) A plowing test of from three to five hours, for economy, tractive efficiency, capacity (in noise per hour and power onignet, quality of work, and the distance traveled without replectables, sengation. 



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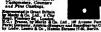
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(6) A correction comparison of design and contraction by the experis mentioned. Out of 500 points, the economy brakes was alloted 150; the maximum brakes best, 50; the plowing test, 200; and the inspection test, 100. The highest not score was 4873 points, and the lowest. 154,05 points, this last tractor enferring a total of 178,88 points in deductions from the gross. The heaviest deductions on the tractors as a class came from stops after starting tests, unswer speed, hot the tractors as a class came from stops after starting tests, uneven speed, hot learings, vibration, lack of water capac-ity for an 8-hour run, and failure to keep the plows in the ground throughout the

The showing at the brake was quite uniformly good, developing some very close scores. Little distinction was made betion; hence the awards were settled wher the average spectator likes to see then settled, i. c., upon the plowing field. The appended table, condensed from the offi-cial tables, and with bewildering extraplace decimals excluded, shows briefly the most important points of comparison, the total scores, and the relative standings (The official tables show comparative per formance or score on 178 points—a mass of figures that make better reading for the engineer than the layman.)

Onip one tractor failed to win either a diploma (in a case of no competition) or a gold, silver or brouze medal. Case won seven gold medals and one silver medal, Avery, three silver medals and a brouze medal; and Sawyer-Massey, one gold medal and three silver medals. In a separate test for engine gaug plows, Caswon two gold medals, and Avery two sil

A new feature in the observing was the use of a vibration detector, ingeniously devised from part of a steam eaglise in-dicator and the necessary llukage. White the apparatus was crude and provision for ching it uniformly to all engines wa lacking, it gave a fair basis for comparison. Penalties of from half a point to èven points were laid as a result.

The most severe criticisms on design and construction were on lubricating avatems and insufficient protection of work ing parts from mud and dust. Tractors specially of the internal combustion va riety, have had the greatest attention paid up to date to the matters of reliability, ease of handling, and economy of fuel Now the tendency is plainly toward a gradual refinement, both to enhance the features sirendy mentioned and to pro vide for greater durability

For the first time, the plowing tests were held in ground that had been plowed before. The furrows were deeper for agricultural reasons, and not so smooth as in cultural reasons, and not so smooth as in the virgin sod of former years A two-foot growth of weeds presented a new, practical problem, to which emergency, however, the plowmen were fully equal The engine steering guide, a boun to the and engine steering know, a bonn of waingle-handed operator who works as true tioneer and plowman both, was not used, evidently because no one cared to risk using the extra fuel useded to push it abead of the tractor. However, the most exrienced tractioneers on the side lines held that by its use, even in such a con test, the tractioneer could have given hot-ter attention to his motor and probably more than offset the added burden by se-

curing greater fuel efficiency. The gas tractor men suffered in two particulars from the very advantages which have made their product such a aful competitor of the long-estab successful competitor or the lished steamer, viz., penalties for failure to carry au 8 hours' water supply, a point which was not even scored on the steam tractors; and labor costs, which were not added to the fuel costs in obtaining the operating expense per acre. The gas trac-tor, either kerosene or gasoline, saves one man, the fireman, but even without this gain the average cost per scre for steam essines was only a trifle lower than for Bercosne, I. e., 443 cents, compared to 500.

Cents The gasoline strenge was considerably higher, Ch.I. cents. The plowing was not so difficult on in 1912, yet not so the foreign call the cent as law.

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CHAPTER I CHAPTE

Part 11. SCIENTIFIC INFORM V THON
Chapter I
CHEMISTRY
Chapter II
ABTRONOMY AND TIME
Chapter III
METROROGOMY.
Chapter III

Chapter IV
MACHINE ELEMENTS AND
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per hour, as in these trials.

sene tractors this year were hardly so shown at Winnipeg in the last few years efficient us in 1911 and 1912, yet secured But the public trial, at Winnipeg or elsethree times as much power for a given where, he a more convincing demonstra-weight of fuel as the streamers. On the tion, and we venture to predict that the other hand, hour costs excluded, the motor contexts of the future will seek to steam tractors developed brake horse-bring out this great factor of venatility power at a rough average of 20 per cent rather than minute technical differences, less than the kerosence cugines, and every ('ertainty such a wonderful educational steamer beat every gasoline tractor on fuel force as the public motor competition will cost per unit of power. This fact alone not have savered its purpose to either mak-is a powerful factor in retaining the mod-er or buyer until the last great question enti-sized steam tractor (50 to 767brake is solved, and the inquestionable superiorhorse-power) wherever threshing is of ity of the general purpose tractor over greater importance than plowing, the horse is demonstrated in a clear, con

On the whole, this year's competition vincing and absolutely impartial way

15 Cam

17 Case 1 12

16 Sawyer 1914 Massey

18 Nawyer 1 12 Massey

as the less me tractor mark of \$012 (53.7 was illuminating. However, manufactur-cents, in the kerusene class).

The 5 and 6-pinw tractors managed by types of tractor more seriously. Some about an area and a half of plowing to of the greatest gas eighteers in the world the hour, as upplied that the tractor of the tractor design. The public

OF ALAST A PROPERTY OF THE PRO

the hour, as against about an eree for the are turning to fractor design. The public delenem. Bight ploys beloid larger gas beauty, secopied the third for for the element. Bight ploys beloid larger gas beauty, set compristively simple work of tructors seem to be good for about 2% polyving and threshing, which these brief acres were hour, and ten plows for 2% to 3 finis supressent. Interest is, now undeulners. Plow for plow, the steam entires shawed more cannot rangely due to a blighter geared speed of travel. Revolution counters on both engines and brakes brought out the interesting variation in belt slippage of from 03 to 1.5 short, lide jobs for the stationary engine, per cent. It is worth a moment's thought and the lighter work of pumping, grind-to-calculate what this loss amounts to on the belts running from about 30 to 42 miles belts, abiling, abiling, selling corn, etc., must be leist running from about 30 to 42 miles belts, abiling, abiling, abiling corn, etc., must be leist running from about 30 to 42 miles declanated.

mechanical efficiency. Gasolite tractors claimed first honors:
It is a nice nut for the manufacturer
in mere fuel efficiency, averaging close to to crack, this actual replacing of the
four times us many horse-power hours to horse. Many farmers are doing it, with
the unit of fuel as steam tractors. Kerothe very types of fractor that have been

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ğ		Drawbar	Acres	Plowed		Drawbar Horse-			
Division	Make of Plow	Horse power developed	Total	Per Hour	Average ' Drawbar Pull.'	power Hours per lb. of Fuel.	Cost fuel per sere. Conts	Total Penalties.	Timal Score.
	Cam-Sattley	10 28	2 10	0.95	2,360	0 603	80.8	17.25	895.00
	Avery	8 53	2 12	1 01	1.770	0.568	57.4	85 5	238.95
	Avery	17 37	2 69	1 57	2,940	0.521	81.9	17.0	316.70
ě	Спло-Наттю	18 53	3.25	1 88	3,540	0.738	57.6	18.06	852.00
Gasoline	Deere	24 5	4.27	2.12	4,800	0.790	56.8	8.15	350.08
٠.	Case-Hattley	38 79	5 12	2 73	7,850	0.915	59 9	16 25	355.55
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П	Avery	9 80	1 84	1 38	11,735	0 241	53 4	100.7	108.10
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1	1)eere	62.48	7.85	4.32	9,000	0,117	49.5	1.6	340.60

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# SCIENTIFIC AMERICAN

NEW YORK, SATURDAY, 1913

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The purpose of this journal is to record accus simply, and interestingly, the world's progress in soien tific knowledge and industrial achievement.

#### Reaping the Whirlwind

ISREGARDING the secondary or immediate causes of the succession of frightful disasters on the New Haven Railroad which has cul-minated in the recent wreck near North Haven, Conminuted in the recent wreck near North invent, con-nection, and taking a broad view of the whole situa-tion, it may be said that these disasters are the bitter fruit of the policy under which the great system has been controlled during the just decade. As proof of this we submit the following propositions:

1 In the event of collision, a modern express pas-senger train, say, of ten Pullmans, drawn by one of train, say, of ten furnishing, drawn by one of the latest heavy express engline, represents when morning at 60 miles per hour, a smashing energy equal to twice that of a 12-inch projectite/discharged from a state of the drawn of the control of th modern dreadnaught

modern dreadmought
2. Since the neciteirals impact of this flying mass, with its precious human fredsht, would mean the instantineous development of over 100,000 functions of energy, it is evident that the very first consideration of good rallroad management should be to provide for its amouth and sufe transit from place to place, by making use of every known physical and human precausion against derollment or collision. .

In view of the inestimable value of the horns freight curried and the enormous and ever insistent perlis which beset these heavy and fast-fixing trains, it becomes the duty of the directors of the road to give it becomes the duty of the directors of the band to give the question of sufe construction and operation the first blace to see to, it that the first appropriations from the trensury are those which are made for the unsintenance in absolutely first-class condition of tracks,

rolling stock, and gameral equipment.

4 Since the risk of travel are broadly propor tional to the density of travel, it follows that the duty of maintaining the physical properties in absointely first-class condition is particularly imperative in the case of railroad systems such as the New Haven Railroad, whose passenger traffic is one of the densest

and most renumerative in the world.

5. Sp far as the truck and roadbed are concerned, the dangers of fast passenger travel may be reduced to a minimum by the provision of heavy and well spiced rails, with the plates interposed between rail hase and tie; by the close spacing of the ties, and the maintaining of them, by continual renewals, in first-class condition; by the provision of ample stone ballast; by the con-tinual improvement of the track through the removal or easement of sharp curves, and the maintenance of outer rails on curves at their proper superelevation; and by the elimination of old-fashloned cross-overs with abrupt turnouts, and the substitution of long cross overs, suitable to modern, high-speed traffic.

ti For the prevention of collision it is abs necessary to mulidula between these heavy and fast-flying trains a proper time and space interval, and to provide a system of signals by which it will be impossible rule a system of signors or which if will be impossible for successive trains to come within certain specified distances of each other. Since the introduction of the block signal system has offered a means of doing this with practically absolute certainty, it is the duty of the directorate of a first-class and wealthy railroad to see to it that its signal system is of the latest and most perfect pattern, and to see to it, also, that the running rules are such as to prevent any playing fast-and-loose with the automatic mandates of this mechanism as

thus applied.
7 Since the protective value of signals depends upon the intelligence and discipline of the train crew, and collisions due to human fallibility are frequent, it becomes the duty of good management to reinforce its block-signal water with some form of automatic ston which will correct the mistakes or care

stop, which will correct the mistakes or caressesses or the train crew, and enable the signal mechanism to stop a train should the engineman fail to do so. 8. The most perfect equipment is liable to failure, and collisions may occur on an absolutely final-class road. Hence it becomes the duty of good management to mitigate the dissatrous effects of gollision (by buildto mitgate the disastrous energy of sometimes in a distribution ing its rolling stock of such astronath and of such materials, that the killing and womating due to such collisions will be reduced to a missionum. Since the exalready had with steel cars has shown them to be a most effective protection to the passengers in the event of collision, it is evident that a conscientious directorate and management will bend every effort to the earliest possible substitutions of a steel for a wooden car equipment.

9. Finally, realizing how greatly the efficiency of the most perfectly built and equipped road depends upon the human element, an elicient management will do its utmost to maintain a high standard of discipline among the employees; and knowing that the unidare to face the public opprobrium which would fall upon them if they endeavored to bring about the reinstatement of an employee who had been discharged for disobedience of rules, an efficient management will see to it also that its subordinate officials are always strongly sustained when an employee is discharged for an infraction of the rules.

Ten years ago the great railway system which has recently attained such an uneuviable notorfort for the number and magnitude of its railroad wrecks, was one of the best equipped and best operated railroads in the country. The character of its roadbed and rolling country. The character of its roadbed and rolling stock and the general safety of its operatible compared well with those of other leading railroads—a condition of affairs which was reflected in the high quotation of lits bonds and stocks in the money market. At that, time, however, there was change of management and directorate policy to which, more than anything class. are to be attributed the present deplorable conditions

There was conceived and put in operation an am-bitious scheme for the shutting out of competition and the acquirement of a complete monopoly of transpor-tation, which was revealed in the wholesale buying up of all possible means of transportation, whether by up of all possions means of transportation, whether by ruil, trolley, river, or neean. Appropriations which should have been made for the improvement of the existing randbed and the construction of additional tracks to accommodate the rapidly growing traffic; for the elimination of short cross-overs and other defects of track inyout which had been left over from earlier years; for the bringing of the rolling stock up to modern standards; for the substitution of steel for wooden cars; for the development of the block signal system; and for the thousand-and-one improvements which are equitinually necessary to meet the conditions of firstoutrinually necessary to meet the conditions of nea-class ralinoading as outlined in the several propositions above given—these appropriations must necessarily have been diverted very largely to furthering the ambi-tious scheme of culargement and consolidation to which we have referred.

emporaneously with this curtailment in the fund applied to the physical upkeep and improvement of the properties, there has undoubtedly been a deterlor-ation in the discipline of the road. Anyone who has ation in the discipline of the road. Anytine who has followed enscribility the various official investigations of the many railroad wrecks of the past two years must have been convinced of this. The frequent overrunning of signals, the placing of comparatively raw men in charge of important express trains, the failure of fingmen to go back over the distances specified for the protection of trains, coupled with the continual complaint of the management that it was hampered by the unions in the effective maintenance of discipline, suggests that in its anxiety to prevent the great loss of revenue du to strikes, there may have been a fallure on the part of the officials higher up to give that hearty en-dorsement which is necessary, if the lower officials are to hold their men rigidly to the rules and regulation

of the pending official investigations, it would be out of place to give any definite opinion as to the immediate causes of the recent accident; but there are certain facts, of public knowledge, which are sufficient to explain the terrible loss of life which occurred. We refer to the old "banjo" system of signals, extremely difficult to see under the condition of Tog which pre-valled at the time of the accident; to the fact that the flagman went back only 440 feet when he should have e back half a mile; to the absence from the heavy train of Pullmans of a single car of steel construction; and to the fact that the engineman was running much faster than he should have done under the weather

The Natural Time Unit in the Organic World Nour days all sciences, including blology, have become quantitative. We no longer ask merely, what he been the course of evolution in the past, but we particularis—we ask what is the age of the human ruce? or, how long must it have taken for man to evolve from a primitive as vary condition is the pre-civitized state? In the times required from require state by the theory of evolution in homeour which which know of the age of the earth with the entryit, profile arrata? For it must be recommended, then, their great this age may be, it is not all indicate and if we to accept the theory of evolution, we show that the viscost that there has been time for the con-changes to have been time for the con-changes to have been the time of the

theory.

Now, whether we suppose that new species arise by
the gradual accumulation of slight variations of the
offspring as compared with the parent, or whether we assume that mutation—sudden radies! departures from the parent stock—play an important part, in either case the natural time unit to employ is the average length of one generation, or, to be more exact, ti age difference between the age of the parent and its off-spring. For the number of cumulative variations in a given line of descent in a given time cannot exceed the or of generations in that time. Let us take an illuminuting concrete example. If you, the reader, con minuting concrete example. If you, the reader, could gather foughter every one of your made innectors in direct line of descent, back to the year core of our present rectioning, you would see before you a small band of not more than about eithy-five men! Even assuming that there had been, during these less 1000 years, a continuous variation in one direction in some characteristic of your anearty, you would hardly expect your great grandfather sixty-five-times-removed to be very different from the men of our time, as not as he is not a first very different from the men of our time, so far as his biological make-up was concerned.

But with the lower organisms the situation is very officient. In the case of the house-fly the length of one generation is about 12 days, and in the recent experiment of Guyenot, a line started in May, 1911, has now passed its fortieth generation—representing about 1200 years of human history. And this is a mere trife as years of human history. And this is a mere trife as combaried with the conditions prestilling among very low forms of life. Miss L. L. Woodruff isolated a parametrian (slipper unimatedne) on May 1st, 1907, and carefully followed up its progeny. In the five years from the date of inception of the observations, to 1912, as connected and the triple of the Scotch power, and absolutely unthinkable multitude, and their volume, had they all been preserved, would have been about ten thousand times that of the earth. With such rapid succession of, generations we may well expect marked evolutionary changes within historic times, or even within the course of a few years.

# The Aviation Lessons Taught by the Tripolitan and Balkan Campaigns

HE lessons taught in recent European army maneuvers were confirmed and corrected in the Balkans. France and Germany are already fully equipped and organized for waging real aerial war, the one in aeroplanes, the other in dirigibles. The maneuv of Austria and of England have shown that they too are prepared, although to a more limited extent

The wer in Tripoli taught us more of the possibilities of aircraft than the campaign in the Balkans. In Tripoli the climatic and geographic conditions were so favorable that, despite an utter lack of aerial organizaition, the Italians were singularly successful in the air. In the Balkans, the climate, local conditions, and the geographic panorams offered difficulties which showed the absolute necessity of an organization of the kind thus far wholly provided for only by France and only partially by Gers Germany.
nents of the Italians in Tripoli were com-

The opponents of the Italians in Tripoil were com-posed chiefly of Arabian irregulars and comparatively small Turkish forces of regulars. In the Balkans, on the other hand, there were on both sides great masses of regular troops, improved artillery in great quantity and strong fortifications. In Tripoli the aeropianes, much to their advantage, were glways able to return

much to their advantage, were always able to return to the same camp, where they could be well cared for. Tripol is a sandy desert, quite flat, with an occa-sional oasis. Actual fighting there was confined to a sional ossis. Actual aghitug there was confined to a comparatively small area. The scroplance were not even required to follow troops on excended marches, because there was no object to march for. The coun-try has no resources, few cities and only a feeding population living in tests and shirtings from easily to cases. The enemy was naturally very sitesty. Forces of arabian irregulars appeared to-day only by disburial again to-morrow. Hence the six society sides of the lard put to if to find them; but in this task the simple try of the landscape and the marregionity sides at week.

of great-applicance.

Methor in the Balance says to Tripot had the artylets his deficial intrings assume graphs and open Tripot had the artylets his deficial intrings assumes and supply They were pot organized integer word, arm.) In the encoded of the samplary the Tatagon, which of the samplary the Tatagon, which of deficial files. In the Balance, the styling interests of the 4th cases followed that yughts pair the defici. He samplar many formed deviles gather produce sections of the 4th open produced to the position price and the samplar produced deviles gather produced to the position price and the samplar produced deviles gather produced sections of the 4th open produced to the produced section of the samplar produced to the samplar prod

#### Electricity

The state of the s

Westminster Abbey Electrically Lighted.—During the occunation of King Edward VII, in 1902, Westminster Abbey was temporarily equipped with electric lights. Again electric lights were used at the occuration of King George V. Now the temporary installation has been enlarged and made permanent. The Abbey is equipped with 50-watt, 226-wott metal filament kamps, operated on a 200-wolt drown. The organ is also provided with two blowers, each driven by a 514-horse-power motor, operated on a 400-volt circuit.

The Wireless Statish on Macquaris Island, which me established by Dr. Mawon's antarotic expedition, is suported to have been taken over by the government of Statistics to serve as a permanent westber station. Of Statistic midway between Australia and the autoretic continent, its reports will be of immense value to the weather forecaster of the commonwealth. The meteorological outpoot maintained by the Argentine government in the South Oriencys, in a higher lattitude than Macquaris, has not at present any telegraphic outminisation with the world, but the excellent of a wireless station there has become a practical quegion on secount of the important which failuries in that violatity.

Wiesless and Westker.—Writing in a recent number of the Beletical World. A. H. Taylor tells of his investigation of the effects of weaker. All Taylor tells of his investigation of the effect of weather on the transmission is in almost every case particularly favorable when cloudy weather prevails between the communicating stations. When the area is only partly cloudy he is inclined to think that transmissivity is better when the sun is shining upon the receiving station and its neighborhood rather than the vicinity of the transmitting station. But in such case the transmissivity is not so good as when the cloudy area includes both receiving and transmitting stations.

To Effective the Norfelk and Westers Railread.—

To Electrify the Norfolk and Western Railread.—
Contracts have been let by the Norfolk and Western Railread.—
Contracts have been let by the Norfolk and Western Railread to electrify the Bluefield-Virian section, which is 55 miles in length. An overhead toolley system will be used like that of the New York, New Haren and Hartford Railread. Single-phase 25-eyele alternating current will be supplied at 11,000 voits presence. Over this line 55,000 tons of ocal are handled per day. Twenty-six 130-ton cloetrio locomorives have been ordered, adapted to run at speeds of from 7 to 26 miles per hour. The line includes a 3,000-00t tunnel, which is very difficult to ventilate. The electrification of the line is to be completed next summer.

Dementia Telephonica.—An indiscreet Berlin lawyer any Medical News was adjudged guilty of slandering the post-office administration, which controls the telephone system under the Teutonio polity. The particular offense of this Berlin astorney was that he called telephone grits "camels" and "absep." The culput's dense was that telephone operators delight to torture the violus at the end of the wire; one day he had called a number nine times within three quarters of an hour and each time had received the tantalizing answer that "the wire is busy"; complaining then to the central manager he learned that his connection had been free all the while. The court's medical expert testified after an examination of the defendant that the latter was of a highly nervous temperament, and that there were asses of mer who had gone insise from telephonic wexation (Telephonicges), but that neverthelose he had not as yet passed the state of legal responsibility. He was fined 200 marks (865).

but that nevertheless he had not as yet passed the state of legal responsibility. He was fined 200 marks (2805). Chrona-Platographs of Hertaian Waves have been made with great precision by H. Abraham with his new apparatus that includes a Carpentier galvanometer designand for rapid movements which reference and only the same and the process of the waves. Using a small mast in the grounds of the Paris Observatory, he residued waves from the German Norddeich port, these being taken down on the pages strip together with seconds marks from the German Norddeich port, these being taken down on the pages strip together with seconds marks from the Observatory dook. He took down waves from the Effel Tower in the same way, and can mainten time form to a thousand of a second on the time to the same way, and can mainten time form to a thousand of a second on the time that the contraction of the pages that the contraction of the pages that the contraction of the pages that the contraction of the time that the time. Using a scalable to contract of the details and the time of the contraction of the time that the time of the time that the time that the time that the time the contraction of the time that the time. Using a scalable to the time that the time that

#### Science

A School of Pisciculture is to be established by the rovincial agricultural council of Bohemia at Eger.

The Largest Searchlight in the World will, it is reported, be installed on Mount Tamalpais as a feature of the Panama-Pacific Exposition.

The Mawson Reliaf Expedition, commanded by Capt. J. K. Davis, is to sail from Melbourne for Mawson's headquarters at Commonwealth Bay the last week of November, and hopes to be back at Hobart with the whole party by February, 1914.

A Status of Lord Kelvin will be unveiled at the University of Giagow on October 8th by the Lord Rector of the university, Mr. Birrell. The Kelvin memorial window in Westminster Abbey was unveiled on July 15th.

As Experimental Study of Vantilation Problems will be carried on for the next four years by a commission having at its disposal a fund of \$50,000, which is part of a gift made by Mrs. Elizaboth Milbank Anderson to the Association for Improving the Condition of the Poor. The chairman of the commission is Dr. Charles Edward A. Winshow of New York.

Radioactivity of the Atlantic and Pacific.—An Argentice scientist has made a series of fifty measurements of the radioactivity of the cosans, fifteen in the Atlantic, south of Montevideo, four in the Magellan Strate and thirty-one in the Pacific, south of Callzo. The radium emanation value, expressed m Mache units, was 0 14 for the Atlantic ocean; 0.09 for the Straits and 0.08 for the Pacific

A New Vegetable Ivery.—According to a consular report, M. Gaston Bonnier has submitted to the National Agricultural Society of Paris samples of a new vegetable ivory made from the ablumen of the fruit of a certain small palm, of the genus Hybanen, growing in the forests of the French Sudan. The product is said to resemble attempty that of the ordinary ivory-nut (Phystelephas macrocareps) of South America. The nut of the doom-palm (Hyphene thebales) has long been used for making rosaries and small ornaments.

used for inating reastres and amount ornaments.

A Cellege of Tropical Agriculture. The project of establishing a college of tropical sgriculture is being extensively agitated in Great Britain. The Board of Agriculture of Ceylon has appointed a London committee to accuse public interests in the question. At the annual meeting of the Ceylon Association, held in London June 12th, it was unanimously resolved that the association approved of Peradennya, Ceylon, as the best site for the proposed college. The famous Royal Botasile Gardens are situated at Peradennya, which is a suburb of Kandy

Gas in the Cartiles of Trees.—Prof. J. A. Ferguson, of the Pennsylvania State College, reports a currous phenomench connected with the cutting of hardwood trees in the Orark Mountains. Cartiles near the base of the trees are often found to contain gas. When these excited are cut into by the oak the cutters of the region the gas ecapse with a whisting sound, showing it to be under pressure, and if lighted it will burn with a faint yellow fame. The sides of the cavities containing gas are in all cases darkoned and look as though seared with a hot fron. The popular belief of the district is that these trees are connected through their nots with a test trees are connected through their nots with a tast trees are connected through their nots with a subternanean supply of natural gas, and the land on which they grow is valued accordingly. An examination of the gas collected from a cottonwood tree was made by Prof. Bashong, of the University of Kansas, and it was found to be substantially the same as natural gas with the addition of some free hydrogens. Prof. Ferguson believes, however, that this gas as the product of decomposition of the heartwood of the trees.

Steeping Tasi Veleane. With the aid of a special appropriation of \$9,000 from the colonial legislature, the Philippine Weather Buresu has established a seismological station on the shore of Lake Bombon or Tasi, about five miles frem the volcano that caused so much destruction in January, 1911. The building, wishis is of reinforced conserts, is situated about twenty feet above the level of the water, and thus commands a view of the lake and the volcano (the latter being on an island in the middle of the lake). The location is near the ridge of a fault which radiates from the volcano in a nearly southwest-northeast direction, and so expected to be very favorable for registering the alightest shoots having their origin in the volcano. The practical purpose of the institution is to obtain timely warning of, any impending ecuption and warn the inhabitants of the district. The station is equipped with meteorological instruments, a Vicentini microsimograph, and an Agamenones estimatorphy; also with a Fries water-stage register, a set of underground theremometers, for use on, the pland of the volcano, and two small deep-sea sounding thermometers for locating some of the subharenease steems were that are supposed to exist sevond the volcano, and two small deep-sea sounding thermometers for locating some of the subharenease at team wents that are supposed to exist sevond the volcano, and the original content of the subharenease at team wents that are supposed to exist sevond the volcano, and the proposed to exist sevond the volcano. A fine motor journel, easing the content of the such that the volcano is a supposed to exist sevond the volcano.

#### Aeronautics

German Military Dirigibles.—The German army has increased its supply of airships this year by eight, namely, four Zoppelins, two Panevals, one Schitte-Lanz and one arship of "M" type, making a total of thriteen dirigibles now at its disposition

Another Gyroscope Attachment for Flying Mackines.— Herbert E. Hawes, of New York, city, has patented, No. 1,067,425 a flying machine which includes means for inclining the balancing planes during their lateral displacements which include a gyroscope whose verticeal shaft is mounted on an oscillable bearing and means co-operating with the shaft so that the incretic of the gyroscope co-acting with a laterally tipping frame through suitable connections operates to incline the balancing planes.

Another Gyroscopic Stabilizer for Aeropianes.—A gyroscopic stabilizing devices is shown in patent No 1066,800, to dibinind Sparimann of Venna, Austra-Hingary. The patent presents in connection with other features coupled double gyroscopes which are able to effect symmetrical inovement relatively to the vehicle and also means for looking the gyroscope when the aeropiane is to be controlled by hand, as in ascending, descending or rounding a curve.

A Gyreacopic Controller for Flying Machine.—In a patent, No. 1,086,342; Edward D. Giren of Chicago presents a flying machine in which a gyreacopic wheel is rotatively mounted on an axis councident with the axis of the propeller with a run incircing the propeller. If an operation the motor breaks down or the propeller weases to revolve from any cause, the gyroscopic wheel, on account of its momentum, will continue to revolve independently of the propeller, thereby resisting any effort on the part of the machine to topplie over By changing the machine's course down, the momentum may be reacquired down, the momentum may be reacquired.

Three-dimensional Warfare. - in the two-dimensional rfare of the past the rear ranks have always been held in reserve. In the three-dimensional warfare of the future, when dirigibles and aeroplanes will be used, no part of an army will remain alle for any great length of time. If it is not actually used to attack it will be busily engaged in resisting attack. In that conflict of the future it is not unlikely that aeroplanes will be used in ways undreamed of now. If we cause a squadron of arcoplanes to fly low and thus convert them into a novel cavalry of unlimited speed and endurance, new possibilities dawn upon us. Because the machines fly in three dimensions, because they are speedier than horses, because they are numerous, they need not fly in rigorous formation. They can attack the enemy from any direction That agroplanes may become great fighters as well as great scouts is shown by the simple philosophy that the fighting power of mounted men rests in the strength of their horses. How can we contemplate the tremundous concentration of brute force in a 100 horse-power antoplane carrying two men and not conceive of aggressively employing this power? Travel swiftly and you are safe from fire no matpower? Travel swiftly and you are safe from fire ter how close it may be at hand. Rush past a r fle sixty miles an hour and he will not be able to hit you, although the distance be only a hundred feet. All that this implies is courage - the soldier's stock in trade—as well as skill enough to navigate the turbulent, swirling ground current, and a motor that will not fail at the crucial moment

Distinguishing Friend from Fee in the Air.—In time of war it would surely be difficult to determine the automaticy of an arcsplane flying at a great altitude. It as concivable that frondly arcraft might be bombaried and hostile machines allowed to escape. The sky is susually so lummous that a flying machine appears althouetted against it. Hence the device, used in the Balkans, of painting the outer ends of Greek, biplane wings and the vertical rudder with the national colors, blue and white, was not very successful Whatever identifying marks a machine may carry, must be large. Flags flown horizontally might answer, but even there, at great altitudes, must appear merely as appendages. Besides, if they are not to impede the machine, they must be very light. At great altitudes the nationality of an seroplane might be recognized not by the colors of its flag but by its distunctive design. In Morocco and in the Balkans the problem of distinguishing friend from foo in the sir did not arise, simply because in both campagns the use of arcraft was rather one-sided. The doubt whether a machine is a friend or not may cause the forces on the ground to lose the fow flowing monitors during which they have a chance of bringing down an air sount. Moreover, there are at present too many types. The same service types are to be found in several armos. Hence, it would be difficult, if not impossible, to recognize the instansity of a flying machine from its build, as sailors recognize a ship by the cut of her jib. It is far easier to telently airships chiefly because of their size. There is no possibility of mutaking a German Zeppelior for any other type of craft. With the Parseval type. The German "M" type is easily recognized, as so is the French Lebaudy.

at me mands of the workman who, by his own musclar power, presses the tool žirnly upon the work and magnitud a support. In sharing large lamp reflectors and similar objects in this manner, from thick disks of from, brass or cupper, the musclar effort required is so great that the workman must be strapped to the lathe. The most hand the strapped to the lathe. The work is very fatigulag and often causes cronic disenses of the liver and other organs, in addition to

discusse of the left hand, which the workman uses to hold a guide against the rim of the rotating disk to prevent excessive vibration. Articles that have bulged cannot be worked into shape because of the danof the operation. The process is o very slow and requires great skill

Hermann Rahn, a master mechanic of Heriba, has patented an apparatus free from the defects and dangers mentioned above. The essential feature of the device, as shown in the accompanying illustrations, is a pair of levers. One of these vers serves as a guide and a sumort for the tool to which it is attached, while the requisite pressure is applied by means of the second lever which can be operated independently of the first. In order to enable one operator to carry on the entire process alone, the rim of the rotating ob ject is guided by a roller and spring or some similar device, so that the left hand of the operator is left free to work the pressure lever.

In the simplest form of the apparatus the pressure lever is mounted on a pivot attached to the frame of the lathe, while sure lever by a universal joint, and can therefore be moved freely in any direc-tion. In a more complex form, adapted for a greater variety of work, the pres-aure lever is screwed into one of a series of holes in

the periphery of a disk which is mounted eccentrically on a fixed pivot, while the pivot of the tool lever is inserted in one of a series of holes in the face of the disk at varying distances from the center. By this arrangement the leverage and the pressure can be varied without affecting the guiding of the tool, which is free to be moved in any direction desired variations in the form of the apparatus are also available, but the principle remains the same.

Efficient operation of the Rahn spinning apparatus is so casily acquired that an abskilled workman, after two or three days of practice, can turn out more work can be accomplished in the old way by a Further workman who has had years of practice more, it is possible to work sheels of twice the maxi-

mum thickness used in the old proce num thickness used in the old process, and yet no straps or other devices need be used to increase the pressure. The average waste produced by unskilled workmen in the luproved process is said not to exceed two pieces per thousand, while heretofore the most skilled operators have counted on a waste of from ten to twenty pieces per hundred. One of the greatest advantages to the new pro cess, however, is the freedom from accldent and discuses to which the operators constantly exposed by the old method

#### Variable Speed Hydraulic Trans mission for Motor Trucks

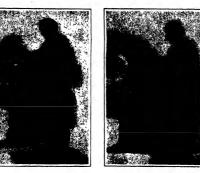
O NE of the most essential elements of the motor vehicle is the transmission system, for if this important part is not properly designed no end of trouble will result. The type of transmission most generally in use in both pleasure cars and motor trucks is the change gear set using spid genry. Of late years, however, the designer has been turning his attention to the development of other types of trans missions with the object of overcoming the inherent

disadvantages of the prevating spur gear Although the variable speed hydraulic transmission Ulustrated herewith, is not entirely new in principle it has been reduced in size and simplified in design for application to the motor truck. This transmission system consists of a reciprocating, multi-cylinder, rotating, single acting nump and two motors of much the same construction and operation, The pump is direct con nected with the engine shaft, while one motor is connected with each jack shaft. The pump and two motors are encased in an oll-tight, cast-iron housing as shown herewith. The working medium, by which the motors

are actuated by the pump, is a medium heavy machine oil. Besides the mechanical advantages of the hydrau-ild transmission system there is the added advantage of constant hibriestion of all moving parts.

The second se

own in the engraving, the main axis of the pump As shown in the engraving, the main axis of me pump harrel R is in the same line with the axis of the driv-ing engine shaft A, while the axis of each motor cylin-der C, stands at an angle of 45 degrees with that of its corresponding jack shaft D. The driving head R, which holds the piston rods, is rotated by means of a plate F keyed to the shaft of the engine. This plate is notched around its periphery to receive the piston The pump driving head E is so constructed that

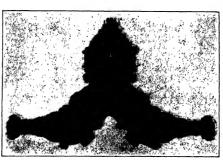


New method of shaping sheet metal objects by means of the Rahn lever apparatus. It can be done by an Old method of aninning sheet metal The operator must use the strap is order to obtain the necessary pres-

It rotates about an axis at an angle of 20 degrees, either side of the normal, with the axis of the driving shaft, This gives the driving head a total movement of 40 degree

On the other band each motor drive head  $\Omega$  is fast-oed to its corresponding jack shaft D. The fall stroke of the pump pistons H is shorter than the stroke of the motor pistons, and by regulating the angle of the driving head E, which is done by means of a land lever varied from zero to full stroke, while the stroke of the motors remains fixed. The pump cylinder burrel is keyed to the engine shaft, while that of each motor rotates on a fixed spindle, and is connected by means of a bevel gear J, to the jack shaft D

Speed variation may be obtained in two ways, each



The new hydraulic transmission with section of casing cut away to show struction of oil pump and motor,

method being independent of the other, while both are capable of simultaneous action. First, with the engine running at a constant speed, the speed of the vehicle may be varied from full reverse, through zero or neutral, to full speed ahead by changing the angle of the pump head E, by means of the hand lever, as explained above. This varies the stroke of the pump pistons, thus regulating the cylinder displacement. Second, the speed of the vehicle may be varied by maintaining the pump in any desired position and operating the fuel lever to regulate the quality of the explosive mixture passing to the engine cylind

The peculiar combination of the hydraulic pump and

motors gives somewhat the same artice, as a universal joint, inasmuch as it provides a positive reassection and rotation between two sharks operating at an angle with each other. Since the working fluid is practically as-compressible, if forms as positive a link between the sugino shark and the direting wheels of the vabilies as es the usual bevel gear differential.

One of the principal advantages of this up that it entirely eliminates the measurity of a closely that it entirely eliminates the measurity of a closely its attending weight and frequent trouble. Also braking may be accomplished by operating the lever, the necessity of two sets of friction was obviated. Throwing the lever to sets or neutral,

the vehicle against forward or backward travel. Herewith the complete species, is shown installed in a motor truck change. It will be noted that with this transfer site the cheases is recognitively securities, because in all mechanism inclous to obstone, which is crutial, brakes, and gruy gard 'grounds.' Although the pressure on the working study argue with the country of course.

fluid varies with the amount of power transmitted, and may reach 1,000 pounds per square inch under heavy service, the pressure may be reduced by increasing of the transmission system.

#### Action of Ultra-violet Light on Animal Organisms

GREEN plants are known to thrive particularly in red light which is ed by their chiorophyli, and water plants often adapt themselves to the greenish-blue light they receive, by assum-ing a red or yellow coloration. Blue and ultra-violet light does not exert a favor able action on green plauts, while be teria are injured and, in the event of a prolonged action, killed by these light rays (disinfecting power of light).

Many inferior animals perceive ultra-

violet light directly, being often disagree-

to carry their pupe from the light visible to man into the dark and to shun even the ultra-violet rays invisible

greater spectral range than man. Heat rays exert on the skin and mucous membranes effects different from light rays, the action of which lasts longer and may result in inflammations as well as excite the formation of pigments

In view of the conflicting views recently enunciated as to the action of ultra-violet rays on the retina and other media of the eye, Dr. Spuler, in a paper recently read before the Carlsruhe Scientific Society, considers the action of these rave on the animal organism. Abart from the solar spectrum, he examines organism. Apparets spectrograph the various sources of light in common use, ascertaining the absorption of various

glasses as well as the refractive media of the eye Open are and quarts mercury lamps were found, spart from the sun, to be the only sources of light giving out ultra-violet rays in any appreciable amounts. An ordinary thin glass plate will absorb a great part of the rays en uating from the sun, to which all those living much in the open air, are exposed; such persons, however, are known just to ossess especially good eyes.

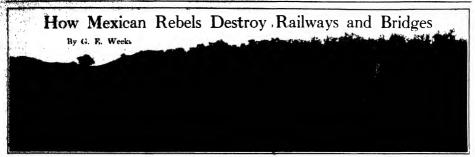
On the other hand, it should be remem-

bered that any strong source of light re-duced more or less to a single point will cause glare in the visible part of the spec trum, against which any glass affords some protection by absorbing part of these rays. The task of illuminating engineers therefore consists in providing a light similar to diffuse daylight such as (apart from the distribution of energy) is to found in indirect lighting.

Two New Foreign Institutes of Science

The executive committee of the German Society for the Encouragement of

Science and Industry, known as the Refer Wiffed Geschischaft, has recently decided to found a Hife dynamic and Aerodynamic Institute, as the Giftin University. It will be in charge, of Pays, Land Prandtl. At the last meeting of the Augustice, held June 17th and presided over by Frot Hars Emil Fischer was elected vice-president to a Prof. Ludwig Debrilds, receipt december note that the Coal Institute, founded at Mrs. note that the Cost Institute, required at minutes budget with be 120,000 marks, of which 150,000 marks are only tributed by industries established in the region of the 



Track pulled loose, wreckers piling up ties preparatory to burning.

THE deliberate destruction of railroad I tracks and costly steel bridges is a thing not often seen, but since the beginning of the Madero revolution in Mexico in 1910 such destruction of valuable property has been one of the favortie methods of warfare in that country adopted by those opposed to the existing government. This in due not alone to the desire to prevent the use of the roads for the transportation of troops and supplies, but also to the fact that the lines chosen for destruction are the property of the national government, or at all events a majority of the stock in those lines is the property of the stock in those lines is the property of the stock in those lines is the property of the nation. This is true of fully three fourths of the railroads is the Republic.

Many hundreds of miles of track have been destroyed, hundreds of bridges, many of them expensive steel structures, have been burned or dynamited, and it is said that over fitty per cent of the rolling stock of the national lines has also been wrecked, burned or otherwise put out of

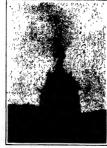
commission.

After Madero triumphed some effort was made to restore the destroyed lines and bridges, but rebel bands in various portions of the country made this a difficult task, and when in February last he was deposed and assassinated, there was a very large mileage which was still in need of restoration. As soon as Ruerta assumed power, the Maderiatas—now termed by themselves Constitutionalites, but by their enemies called rebelm—at once began destroying the railroads by which Federal troops could be moved against them, and at the present time there is a larger mileage of track out of commission than at any time during all the troubles of the past two and a little troubles of the past two and a little troubles of the past two and a little froubles.

or sae past two accession the writer had the On a recent occasion the writer had the privilege accorded him by the Constitutionalist leaders of visiting a point in the State of Coahulla, where track and bridge destruction was in full progress, and a most interesting sight it was. He was also permitted to carry a camera and take views of the work of ruin, some of which are given herewith. Up to the past aix months track destruction had been accomplished either by the use of a wrecking crane, which littled sections of rails and



This woman soldier travels on the train with the other guards.



Engine backing up and tearin



This shows how the 220-ton engine is shackled to the track, preparatory to pulling.

ties boilily and plied them up ready for intuiting, or by the slower process of the claw-bar, wrench and pleb. But a Constitutionalist expert devised a new system, which is shown in the accompanting photos, taken "on the spat" by the writer. A trench is dug between two ties, through which a heavy claim is passed.

A trench is dug between two thes, through which a heavy chain is passed around two opposite raths and made fast in the center of the track. To this one and of a heavy steel cable is hooked, the other end being made fast to the counting on the engine plot. At the signal the engineer starts his becommotives slowly backward, and as they are huge 220-ton "consolidations," with 22-inch by 39-then cylinders, one can readily imagine that something has to give. And if does." The raths are torn tone from the spikes that hold them to the ties and are dragged closely together in the center of the road-bed. The ties are tone tone from the spikes that hold them to the first and are dragged closely together in the center of the road-bed. The ties are tone some from the baliast and dragged into gibes, while in many cases the raths are badd, bett and twisted by the force applied. A raing of men follows the engine, pullus the out op of the man the case that the start of the spike of the substitute of the sum of the spike of the sum of the ground twisted and control data sints of shapes, and of no further use and the the case constitutes the tess re-translation and the spike of the second of the force of shapes, and of no further use and the second case the control of the same and the period of the second control of the ground twisted and control data sints of shapes, and of no further use and the second case of the second control of the same case of the second case of the same ca

An interesting feature to railroad men was noted in connection with the resistance offered by the fish and ite plates to the work of destruction. Where the old-fashioused fish plate was used, a single pall offered destroys from two to three kilometers of track before any resistance surficient to break the clusta is encountered. In this way as high as twenty kilometers of track have been tora my and burned in a single day. But where the fosibilite tiplates are used, as was the case with the track the writer saw destroyed, not more than one hundred to two hundred feet could be tora my at a time, the claim usually breaking in less than that distance owing to the immensely superior resisting quality of the fite-plate named. No better text of the comparative merits of the two methods of rail connection could be devised. The rails on this portion



The and-fact bridge at Salitage, mined in readiness for dynamiting.

Manager Caraman Cara Menanca and A.



Bridge at Obeyos burning after having been dynamited.

tion of the track were 85 pounds in weight and are stamped "Carnegle

The destruction of wooden bridges, of which hundreds have been ruined, is of course easy. They are simply saturated with oil and burned. With the steel bridges, however, it is different. These are destroyed by drillby boles into the piers and abutments close to the bridge seats, as also rows of holes horizontally along the bottoms of the piers where they can be reached. according to the state of the water in the stream These holes are charged with dynamite, the fuses are These holes are charged with dynamite, the fuses are connected with a battery of the type used in the coal nines in this region, and when the opportune moment arrives the electric current is turned on and the bridge is usually pretty effectually ruined. The accompanying ws a truss bridge at Obeyos, Conhulla, or line of the old Mexican International Railway, which was destroyed while the writer was at the place. This was merely displaced with dynamite and the woodwork ed. The solid steel girder bridge, five spans, over the Hermanas River, was destroyed a few days before the Ober & heldge, but it is so far within the enemy's lines that no photo is available. The solid stone masonry piers and abutments were completely destroyed, ng to eye-witnesses, leaving the girders bent and according to eye-witnesses, leaving the greens near and twisted at the bottom of the stream. The photo of the Sabinas bridge, also given, is that of one of the largest and most costly rallroad bridges in northern Mexico It consists of ten spans of solid steel girders, each 81.6 feet in length, carried on plers and abutments thirty feet above the water. This structure lies directly in the line of the advance of the Federals, and it has been prepared for instant destruction in the same manner ther bridges farther down the li

It will cost the national lines of Mexico many millions of dollars to replace their destroyed rolling stock, bridges, stations, etc., and this promises to cause them great financial embarrassment, if not bankruptcy, which at this time seems imminent. It will take years to put these roads in the same good condition which prevailed at the time Madero began his rebellion against Presi dent Diaz.

Pledras Negras, Conhuita, Mexico, August 29th, 1913

#### The Necessity of Accurate Railway Track Scales

With an almost unending discussion of ratiway freight rates, it is somewhat strange that tardy recognition has just been given by the Interstate Commerce Commission to an equally important factor in the problem. Prices and rates for commodities and their transportation are but one element in the equation of cost, for it is also essential to consider quantities Where the total amount of the changes is determined. not by numerical count of articles or packages, but by weighing, then the consumer or shipper is as much interested in the correctness of weight as in the selling price or the rate charged for its transportation. In words, an error of ten per cent in the scales is quite as important as an overcharge or rate ten per cent in excess of the proper figure. Indeed, it would seem most obvious that with a business undertaking so highly organized as an American rallway, freight should be weighed with the highest possible degree of accuracy.

Unfortunately such is not the case. We learn from a recent investigation by the Interstate Commerce Commission that three fourths of all the track scales In use in the United States are of defective design or improperly installed, that less than one fourth are properly inspected; that hardly ten per cent are proptested, not to speak of the great majority not being tested in any proper sense at all; and that nearly every-where methods of weighling are unsatisfactory and

This was the condition when the Interstate Comnerce Commission began its investigation in 1912, and such is the condition in large part to-day, though many of the rathways have realized their deficiencies and have undertaken reforms A few lines like the Penn-sylvania, Nanta Fc, and New York Central, which have paid some attention to track scale inspection for sev-eral years, have introduced improvements in design, eral years, have introduced improvements in design, impection and operation, organizing this work with technically that impectors. As most freight charges are computed to and lots by weight, insuling assessed by the hundre, the fit can be seen that the property of the contract of the c d lots by weight, nearly assessed by the hundre specific the supportant this inatter both the shipper and rating of the shipper as a general way officials claim or point due to inaccious the shipper as a general way of the shipper as a defense of present prepared or as an excussion of changing methods.

not changing methods.

In Minnesota and Oregon the Inspection of track scates is undefraken by the State Departments of Weights and Measures, and last January a bill with a

similar object was introduced into the Senate of the State of New York. In southern and western States shippers have formed weighing and inspe etton bureau to secure protection and advantages, but so far as the railways themselves are concerned, outside of a few lines conditions are generally quite bad, and there is lines conditions are generally quite bad, and there is great lack of uniformity. It goese cases care are weighed coupled at both ends, then coupled at one end, and then quite independently. Cars are weighed in motion as well as at rest. Mechanical and automatic recording devices are used in some cases. Not infra-questly weighmenters are carsiess and incompetent. The tare weights stouched on the cars it was found are in error in practically 80 per cent of American freight cars, and of 10,967 cars the figures were actuweighed correct in but 506 instances, and that the

error, which averaged about 500 pounds, ran up to 6,000 and 9,000 pounds in some cases.

While much can be done by the railways, the shippers and by local authorities, yet the Interstate Commerce Commission believes that some Federal commission, possibly the Interstate Commerce Commission, should be given authority to fix the points at which track scales should be installed, to prescribe standards track scales should be installed, to prescribe standars of construction, to test or supervise the testing, and finally to supervise operation. Failing proper local action this would be eminently desirable, but in the meantime much can be expected from what a number of the railways are doing to improve this department.

#### The Military Value of Low Flying By C. Dienstbach

THE real danger some for military aeroplanes in time of war lies at moderate heights. At great altitudes (4,000 feet and more) flying is reasonably safe A second zone of safety lies next to the ground; there, because a speedy aeroplane is most clusive and cannot be so easily hit as may be supposed. Spectators at fly-ing machine meets know how difficult it is to see a machine near the ground after the head has been turned for a moment. To a low-flying machine covers are as useful as they are to cavalry. But at a moderate hei an aeroplane can easily be tracked on its whole course, indeed, it draws the fire of massed infantry and artillery, consequently of a numerous percentage of highly skilled marksmen. Low flying, too, removes the seri culty of losing one's way, which often happens at high altitudes.

Because the aeroplane is not safe at these intermediate elevations, it follows that it must be able to change its attitude very quickly and easily. Safety will probable the desired supports and easily. ably lie in flying low until a safe distance is reached. whereupon an ascent may be attempted. With the attainment of automatic or semi-automatic stability in the near future it may confidently be expected that the aeroplane will become a practical, low-flying vehicle for war purposes at least. The aeroplane will then be like an automobile running on an ideal road which leads everywhere; or like a troop of cavalry which can gallop on untiring mounts across rivers, fences, ditches, trees, with three times the speed of the finest race

The low-flying aeroplane is concealed not only behind hills, woods, and villages, but also in front of them. The sky is the worst possible background for aircraft, son-Fulton trophy in 1910, Curtiss was completely lost from sight while flying below the top of th

Bomb-dropping obviously becomes more effective the lower the altitude of the machine. A squadron of seroplanes flying very low, could suddenly attack a fighting front from the flank and drop bomb after bomb Each machine while rushing along the entire liz would merely drop bombs in its tracks. A miss would be difficult. To be sure, a certain distance would neces-sarily separate a leading from a following machine, not only because of the explostves, but because of the danger that lurks in the invisible wash of propellers. Under the same condition machine-gun fire would prob-ably prove even more efficient, because lighter, and therefore a greater quantity of ammunition could be

But before the low-flying aeroplane can really p But before the low-drying scroplane can really per-form the function for which it is manifesty destined it must be protected. The vitals of an scroplane are much smaller in volume than those of a horse. Hence they can be even more easily protected by armor with out cutting down speed or modility than were the chargers of medieval anights. Already the military s of the world demand protected machines. the war of the future we may therefore expect to see steering gears, motors, and men all incased in bullst proof steel sheeting

#### The Two-speed Rear Axle

IN the Screntific American for August 2nd, in an Agricle on a new two-speed rear axie, it was stated that "the car will travel nine miles farther on a given

amount of fuel with the hi with the low gear in use." Manhactly, this is and the statement should have been The travel nine miles farther on a given number revolutions (700 revolutions a minute for with the high gear in use than it will with the

#### Triumphe in Sargery

THE International Congress of Medicles, repent.

Theid in London, brought many remarkable countributions. We reproduce here from the Devices Them (Weekly Edition) brief notes on two or there of the most startling new advances placed on record.

#### Removal of a Lung.

The Section of Surgery discussed is new breasts of surgery, "Intro-thoracte Surgery."

Sir William MacEwen's contribution to the departs was by far the most interesting and inferential of the subject. In the first place, he wished to demonstrate a patient operated on by him 18 years sage, whose left long had been removed in its entirety for tubervulai disease. The patient had been brought from Glasgow and was seen by the section to be a ground. disease. The patient had been brought from Glasgow and was seen by the section to be a strong, healthy-looking man whose left side was hollow and fallen in. He was engaged steadily at work. At the time of the operation the right inng was diseased, but the removal of the hopelessly diseased bung was followed by im-provement in the condition of the reseathing inng.

provement in the conduction of the remaining lung.

That experience had been found in four other similar cases. In all these cases the spex of the diseased lung had been adherent to the great refl at the root of the neck, and at a later stage in the last four cases the vein and that piece of lung were removed. In the first case and that piece of lung were removed. In the lire case the patient for some days suffered great distress from the "dopping" of his heart to and fro as his position was changed. This symptom was obviated by stitching the pericardium to the front part of the chest wall.

#### An Artificial Kidney.

nonstration which excited great interthat of Prof. Abel of Baltimore.

Prof. Abel presented a new and ingenious meth removing substances from the circulating blood, which can hardly fall to be of benefit in the study of some of the most complex problems. By means of a glass tube tied into a main artery of an anæsthetised animal the blood is conducted through numerous celloidin tubes before being returned to the veins through a second glass tube. The celloidin tubes are immersed in saline solution. All diffusible substances circulating in the blood pass through the intervening layer of celloidin, and can be found in the saline solution, where they can bjected to fractional analysis. In this way Prof. Abel has constructed what is practically an artificial kidney. In many instances the working of the added excretory organ is more rapid than that of the actual kidney of the animal; 3 per cent per hour of salicylic acid can be removed from the blood. Although primarily the apparatus is of use in the estimation and analysis of the diffusible contents of the blood, it is bossible that the principle may ultimately be adopted in the treatment of disease. At the close of the demon-stration, which excited the liveliest interest and discussion, Prof. Abel was accorded round after round of ap

#### Transplantation of the Kidney

Dr. Ernst Jeger demonstrated a number of specimens to show what had been achieved experimentally in dogs. He had successfully removed a place of artery and its nat successfully removed a passe or artery as a stitched in its place a piece of vein taken from the same animal. He had transplanted one kidney of a dog from its abdominal position to the neck, joining the reasi artery to the carotid artery, the renal vein to the jugular vein, and the function of that kidney was co

#### Prototype of the Yale Lock

Prototype of the Vale Lock

O'IR attention has been called to the fact that in a contributed article in the Scurryinc Assumand for August 16th, 1913, on page 125, entitled "Prototype of the Nais Lock" the word "Yale" is possibly goed in a descriptive sense, referring to the particular type of lock. Of course, if the word is so understood in the article such use is inaccurate. The word "Rale" is connection with locks has been for many pains the recognized and established trade mark of the Yale is Towne Manufacturing Company, and it must be designated and established trade mark of the Yale is Towne Manufacturing to Company, and it must be designated and call the particle of the Yale is Towne Manufacturing to Company, and the use to designate the particle of the Yale is the Yale Locks" as the cythoder loop Illustrated and the Article referred to the well "Rale" and and the Article referred to the well "Rale" and and the Article referred to the well "Rale" and and the Article referred to the well "Rale" and and the Article referred to the well "Rale" and and "Yale" is concerning to the content, or chat collegation for market the Article referred to the fact collegation for market the Article referred to the fact collegation for market the Article is concerning to that contents.

#### Creasondruce

The elities are not responsible for aistements place in the province entires column. Amongmous commissions column amongmous comprehensions control to considered, but the names of principal columns in deserta

#### Wanted: A Humane Animal Trap

To, the Effor of the formerises Assessment and Chesty to Allementus States, the Prevention of Chesty to Allementus States, the prevention of Chesty to Allementus States, the prevention of Chesty to Allement States, the prevention of trapping with animals, unto as fewer, etc., for therefre, by means of the old-dashfund steel trap, and the laboratory of the thing is no vividity portrayed by soits, pur and pieture, that I appeal to the ingentions readers of your extensively electricated paper to put their initials to work to device a human method of catching "Solds per sand possure, uses a symmetric residence of your extensively circulated paper to put their imited to work to devise a humane method of catching these assimate, if they must be eaught, and to put an end to she hortible torture-dealing steed trap of the enaturies. To bester understand the subject, I would suggest that your readers write the above-annel society for a copy of the pamphlet, which will be sent free of charges, so that they may see and understand from the illustrations what fur soot in torture of wild azimals, which have the same right to a painless and senselful death that our domestic azimals have. There is a great opportunity for some reader of the Scherricc Aurancan to not only win for hisself the thanks and the gratitude of humane people the world over, but does a more substantial roward in dollars and onts, by inventing a humane method of capturing these animals without first "woulfying" them. "crucifying"

Brookiya, N. Y. GEORGE FOSTER HOWELL

#### The Maximum Parcel Post Package

To the Editor of the Scientific American:

Mr. Taylor's communication, published in your number of July 19th, page 51, on "The Maximum Parcel," is very interesting and highly ingenious. Allow races, is very interesting and highly ingenious. Allow me to observe, however, that no person has any serious doubts as to what is meant by length, although some may evidently differ as to the proper wording of a defi-nition for the term.

The definition of length as "the greatest distance in gittaight line between the two ends of the parcel" got as faulty as Mr. Taylor makes it appear. The and to the state of the season of the season of the season of my rectangular receptacle, for instance, are two, parallel planes and these are equidistant at all points, so that distance between the "two ends" cannot mean distance between two of the "eight corners," selegibled so as to measure at an inclination to the "length"

speak matesize everys, but materials are simpled as as to measure at an inclination to the "length" dimession of the package.

The belvious reason for saving "greatest distance in a straight line" is to cover irregular packages, having no well defined dimessions, and to prevent too long a measurement by bending of the string or tape.

As I construct the rules of measurement, the length and the property of the construction of the string or tape.

of a parcel, however irregular such parcel may be, is equal to "the length of the smallest circumscribed rectangular parallelopipedon." but this would be a reconsiguiar parameters of the transfer of the dangerous definition to use as some of our well fed country postmasters are subject to apoplexy, and you will find that it is difficult to say the equivalent of this school room definition in a few simple words.

Arlington, Va. JOSEPH BECKES.

#### Progress in Air Navigation

To the Editor of the Scientific American: Several recent visits to Hempstand Plains have confirmed a previous feeling of disappointment, that the art of flying is still in the amateur, or bloyde state. The automobile stage or precious application of the genetic discovery seems not only not in night, but not great suggested.

with suggested.

Langley's experiments (Simithsonian contributions, 1891-1893), showed that he had solved the problem except for three elements, all of which have since heen supplied. First, a lighter and more powerful engine. Second, a method of safely leaving the ground and slighting. Third, a method of controlling the course of the aeroplane. (See Hiram Maxim, Century Magazant Lance)

slighting. Third, a method of controlling the course of the aeroplane. (See Hiram Maxim, Contary Magazine, almany, 1980).
Three things strike the observer, on examining the insect mobilines now shown to the public.
I. Sisceiting the engines by twriting the propolars. This 'cortainty assume primitives. Imagine it done raided fee is waterard.

This insteading of the wings by when, wire cords, and fig. signific of steel. These are factored of the by imagine of steel. These are factored of the results of the contained fig. and the contained of the second of the steel of the contained of the second of the contained of the second of the contained of the second of the seco

A. The searther over rough ground must set up a man an the wires and basessings. It seems the arresme

of careless management to subject all these slight bits of steel to the harring and delling sessed by the great levesage of the long outlying places and allerons. A large space like a draw field, could be planked over, and the stage and landing shade with much greater

smoothness.

The wooderful case and grace of the planes, once in the air; the speed, guidance and control; the floating and glitting extent to the ground; all these prove that the main difficulties were solved two or three years ago. Since that time, there has been little gain, as far as can be seen, in the directions of wider use or greater

salety.

A model was shown has wishing its a Breadway window,
of a placform lung beneath, see the state of the context of gravity lowestics, and a parametry hold a new of eight or ten. The presentes stated that it would come to the granted in salety, on the practical three is a suggestion of the state of the salety of the

The progress that has been made in aerodynamics during the last two years has not been journalistically sensational. Hence, is not so widely known as it ought to be. Engine powers on the whole have been reduced and speeds have increased, proof enough that the problem of air resistance and of securing stream-line forms has not been neglected. Eiffel's experiments, painstakingly conducted, for many years, but unheralded in the daily press, have disproved much of what was regarded as aeroplane gospel three years ago, and have enabled seroplane designers to work more intelligently. Even some of Langley's work may be regarded as superseded by that of Eiffel.

supersected by that of Eiffel.

As for the minor points to which our correspondent calls attention, we might mention that more or less successful attempts have already been made to start aeroplane engines with cranks; that the wire fastening of the wings is not regarded by designers as the best method of stiffening a wing; and that some designers,

method of something a wing; and that some designors, notably Gallaudet, have very ably solved the problem of holding wings by other means. The difficulty of starting over rough ground is not likely to be overcome by the means proposed. If a large space "like a dance hall," carefully planked over, is to be the chief reliance of the acroplane in starting, why not recur at once to the old Wright starting rail, why not recur at once to the old Wright starting rail, which is much simpler and cheaper? The truth is that an aeroplane must be designed to withstand the rack-ing strains set up by bowling over rough ground at high speed. Dance hall platforms could never be ubiquitous. Indeed, the French military authorities realize this, and even require machines to run over freshly plowed fields and stubble. It is easier to adapt the machine to the ground than the ground to the

#### Teaching the Tropics How to Live

To the Editor of the SCIENTIFIC AMBRICAN:

In the issue of November 9th, 1912, of the SCIENTIFIC AMERICAN, we find a description in concise form of the application and maintenance of hygienic conditions in the Panama Canal district, to combat malaria, the greatset enemy of the white man in many tropical, sub-tropical, and some northern districts. But for these precautions and their results, it would have been far more difficult to achieve so great a success in time as was the case with the great Panama Canal.

The afore-mentioned article clearly shows that such

neesures involve an extremely large exponditure. The statistics were derived from results obtained with only a part of the workmen employed on the canal, as some men, were not made subject to these measures and others were beyond control because they oured themselves when stricken.

e improved hygienic conditions tend to increase the number of working days, consequently a considerable sum of the working appears is saved, the wages being very high. The sum expended on hygiene will be cov-ered by the extra labor gained and the resulting increased

Persons who have been employed in the tropics under Persons who have been employed in the trypics unner quite different derounstances, for instance, in work on a smaller scale, with limited working capital, lower wages, and remote situation, are inclined to think that the costly method of conducting malaria hygiene is inappli-

costly method of conducting malaria hygiene is inapplicable in the vege transporty of cases.

I therefore want to point out in this letter how, on the Guinan place in Dutoh, Guinan, a notions malaria dissipita at 120 kijoineters from the coast, a really good result was obtained with year, duple guess and little ottilay, but without broughtlatels medicaments. This result was abcomplished with 120 to 18 Europeans of pure European descent, solet of whom came directly from European descent, solet of whom came directly from European descent, solet of whom came directly from the sealered a great deal from malaria previous to their coming under the protection of these hygienic measures, was steadily improving, although residivirus were still

essionally absent through Illness, especially when the bot season had must set in.

For several years malaria has no longer been dreaded by Europeans on this placer, as there were no reports

by Europeans on this piecer, as there were no reports of absence through malaris in all this time.

A dotailed description of these measures is contained any book, "B Brief Outline of the Surinam Gold Industry, Geology, Technique, Hygiene," De Bussy, Amsterdam, 1911 (English edition).

It will suffice to state here that I started upon the le that in a country where the hygienic conditions are entirely different from those of a civilized European country, the mode of hving should likewise be altered

or, and not in some details only.

application and maintenance of hygienic condie applicati tions is not so difficult in itself, but the fact that it extends over a number of people, many of whom are care-less by nature, does not facilitate matters. One has to exert will power, not only upon himself, but over others as well, and this in a popular manner.

For medical and practical reasons, chemical prophy-laxis is not suitable for a prolonged readence. In this instance the so-called mechanical prophylaxis is applied.

the results of which are pronounced to be ideal.

Our precautions did not extend beyond the actual dwelling place, because the surroundings were exceedingly unfavorable for malaria hygiene. Owing to numerous swamps (drowned forest ground) and work pits, drainage or constant supervision would either have become very expensive or would have been altogether in-sufficient. A removal of the whole hody of workmen and their dwellings to a more favorable situation at Savannali, some 5 kilometers distant, would have been savaman, some of knometers unusur, would have peen both expensive and impracticable, because of the great distance of the places where they have to work. Only the insmediate vicinity was kept clean and in good conditlon

The houses were built in such a way that they wer ermanently airy; the light could come in freely, and the whole building was kept practically anophele free Domestle work of any kind was done under ganze protection. The beds were provided with curtains of a special construction, which guaranteed the sleeper absohave been indoors. The houses were connected with each other by means of a long passage, likewise provided with

Suppor was taken at six o'clock instead of at half past After sunset few wished to leave these airy homes, although a pleasant recreation hall within safe reach drow many of the people to intercourse on account of the billiard and reading tables. The work-place was lighted by strong lights in case of night work, the surgood grants in case of night work, the roundings were cleaned, and rost was taken in anophine apartments.

Another successful measure was based on the principle that the staff should have a certain interest in the strict upholding of the simple hygienic laws and the proper keeping of the hygienic arrangements. This was done by the superiors, who set the example by giving the staff instructions about the causes of illness and how to com-bat disease Also a special wage system was introduced This system was based on the principle that every good and careful workman is enabled to earn a very good wage, whereas in the case of malaria or sexual diseases the men had free nursing, but were paid only a small part of their ordinary wage, in the case of any other illpart of their ordinary wage, in the case of any other in-ness they received botter pay. Then there was a premium paid for anopheles specimens caught indoors. The result was that everybody watched the results with the greatest

The cost of our malaria hygione amounted to the sum The cost of our materia nygione amounted to the sum paid in the shape of surplus wages and salaries—in real-ity nothing but a health premium—and the expenditure for the installation of the gains walls, windows, and doors of the buildings. Metheal attendance for malaria cost us next to nothing.

By laying down these rules, work on the Guiana placer was continued undisturbed. The adapted mode of living and the facts that the hygienic conditions and the sases prevailing in the country are generally known. and that the whole of the staff was made responsible for the proper order of affairs on the placer, combined to ereate for our men more agreeable work, and the company reaped the benefits of steady, undisturbed work.

DR J H. VERLOOP.

A Needed Plumbing Improvement.—A plumbers' supply man tells us of difficulties experienced in the of the flushometer valve employed in lieu of flush-One difficulty results from th ing tanks. sure in the water supply which naturally varies the amount of water discharged at each flushing. The problem is to provide some means to overcome or counteract the effects of variation of pressure in connec tion with the present type of thishometer valves, or to tion win the present type of management valve that will not be in-fluenced by the pressure fluctuating in the water su-ply, but will deliver the desired amount of water at each flushing operation, regardless of the service pips

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#### Opening of the World's Greatest Power Plant Damming the Minimippi River to Produce 300,000 Hydro-electric Horne-power.

This effects opening of that wast engineering work In Keston, town, owned by the Mississippl filter Protest Compute, and popularly known as the Missis and then insurented the commental service of the voids greated hydroelectric power plant. The day relact of the Mississimilat this point was made used tic in the top-graphy and pology at the site. Th Maines Should above the days present a full of 25 fee in a stretch of lively ralles, and the blod's of the rive at the sanite are closer to the rive than ther are a up other point in its entire length; furthernore, they ate close to the lanks for used of the distance from to construct a date at the foot of the rapids which ampli rups a computatively small area of overtice by the tree more—a most insperior consideration for th connectful success of the scheme. Furthermore, the billion of the river at the elfe of the dam courbs of nd like Unresone, affering an excellent footlag ludged from the engineering viewpoint, for the dur pd other pressure wet

#### The Bare

The great drop is which the water is multifained at the desired head for the development of the hydraulic power, is 42 feet it trebes while on the hed of the rive and 20 feet wide at the top: It strade \$1 feet in heigh alove its foundations, and its length, including it singularity is 4 600 feet. It is composed of 100 upried statis, temperating 30 feet for the clear, the piece i 6 feet thirk. The solliest sections are forused of arctes 30 feet long and 52 feet high, with steel gate manufed on too of the selligent, the guies below (I feet high is 22 feet wide. The apetream face of the spillway don as thus formed in the openings between the arries is vertical, the downstream free is formed in an upper curve. The height of the water in the paid ove the dam is regulated to the spillway gate

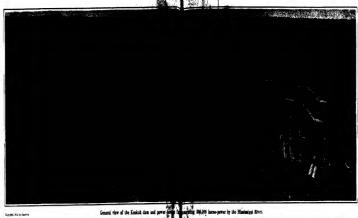
#### The Power House

At the western end of the dam and of rath angleto the longitudinal axis of the same, is the test power larger, which extends down attrem for a distance of 1.718 feet. The width of the full diug is 132 feet 16 Inches and its total legist is 177 feet 6 inches. It contain fore those on the lead of which are about the thirty 10000 house power graculture and their studilistics, and on the three flues above the oil excludes and electrical accessfies. The substructure, which is one tramonolithic mass, raiseds 10 feet from the limeston hed of the river to the generator floor. Within this unes are formed 30 vertical colladrical chambers for lutities, each with its establis for the littles of the water above and outlets for the exit of the water There are four covains intokes for each taridue. These converge lino a servil chander. 29 feet la motor, which is formed with a spiral floor, so shaped that the water hardages on every total of the circumyear of the include with equal relocity and equal laysie. After the water has passed through the tax blue. It experges through a draught tube which is eligiless feet in dismeter at the top, and at the bettern is obling in share, this portion passenting 22 feet 8 inches in verified bright, and 42 feet 2 limites in horizonta dimension. The bottom of the drugget tutes and tail mer is 25 feet below the hollow of the files

#### The Turbines

The intitions are of the general Practic type, moditel 116 lupewel to sait the conditions. The torus rapidly of each is 10000 have power, and the over load equality is 13,500 hone-power. At \$1.7 revolutions nor tribute that have shown us officiency of Si per cent This high effectory is due, in part, to the construction of the intake and the spirally shaped seroll chamber oid audershot naterateel is driven by the water surfaing upon only a small part of the ritrile of blode-Nest to the oversial waterwheel the energy of the wa ter may applied to the buckets at only a sentil are of The modern type, in which the whole ch numberage is available for the development of power. other things being equal, will give the largest natural Because of the compandisels low bend the fulling is board on a board of 32 feet). It was presently for pes great quantities of water through the turidies is serve the resulted motes - better their great size and neight. The turbine, as will be seen from our from microsomorphic is a fuge costing. It is in feet 2 forter idades. It is stood at the lottom of the vertical cells drical clauses prepared to 11 to the nor creir of the foundation. This chapter is liked with s steel extinder, and all the top and bottom is paper and lower times which support the entire weigh of the power until. Each lines series 212000 named The cities weigh 100,000 populs each, and the weight of untitue, the shaft, and the electric generator correled at the top of the shaft-that is to say the weight of the

revolving puring of each unit is 275 tons. The whole



General view of the Keoksk dam and pow

of this weight is carried upon one bearing which, it can b well anderstood was usule the sainlest of very careful design The water is controlled and is guided to the unterwised by cannot exhibit term term terminal axes. These can be specially so that they completely shut off the water from the wined, or they can open sufficiently to negati all the water to flot through. Their position is regulated by a governor acting through a system of levels which automotically controls the

#### The Electric Generators

At the upper end of the turbine spindles, at the level of the present four, are carried the potention, each of which has coparity of 1300 idiowatis. The energet is alternating 3 place 25 cycle, generated at 11,000 volta pressure. For ne of the current this relative will be unlitteded, but for long-distance transmission it is stepped up by transferences to 110 int with. The dispeter of the resulting field is 25 feet 5 licies, the outside disputer of each presenter is 31 feet 5 torbes, and the exterior holgh) above the generator floors is il feet 3 lookes. The efficiency is tigh, reaching 56 per cen-

The Ice Fender, Sea Wall and Forebay, and swinging in an easy curve to the lown shore, is the lev fender, a courteie structure, 2,925 feet long, which is en used of 20 spras with 10-foot plets and 68-foot openings. It is til fect wide at the leftom, and 8 fect in width at the log At its instace cod is a footing home of beary timbers which is 300 feet in leasth. The water flows into the forcion through the mealure between the piers, and the ice and driftwood are stanced is the useer parties of the structure. During the my/gaing sesson the figuling been is swang lock against the sizer lite, to perall the passage of boots. From the Indices end of the ker femier, down to the drydock, there has been built n prosite ser wall, 45 to 22 feet in beight, and 1,110 feet in length, whose function is to protect the influent tracks of th C B and O Bullous. The tower butter, he funder and sea walt mark the localization of a large forebay, from which the water flows through laiets in the western wall of the nowlarger for the operation of the inchines. At the demostrean of the fermion has been built a look which is 100 feet with #0 feet long in the clear, and has a lift of 40 feet. The tim of lockwor is from ten to fifteen minutes; and touts meeting through the locks between Reeksk and Meatrose save tw tours over the time occuried under reestors conditions

It is an interesting fact that most of the wat

se axis of power house



only development on a large scale in the faurt of the l'id States Its size and innertance may be indeed from the fact that he output will equal about built the total of all the fiv comunities on Magara on both sides of the International logadary. Practically all of the power will be available for manufactoring. By means of long distance transmission lines it unalistic for light, power, traction purposes in the ettles of the middle west over a railing of more than 100 miles n designed by Hugh L Corner, to courses and hustress activities is due not out; the design and ellon of the plant, but the scenting of the \$30,000,000 of cuttal pecessary in sut the entertrise through.

eat to the Catled States has taken place along the sea

of the Perife and the Atlantic. The Keokak enternalse is the

#### An Encyclopaedia on the Card-index System dy Our Berlin Correspondent

HB amount of data constituting the sum total of in-This amount or date community being grown at a truly marrelous rate; The scope of libits; has been extended over theoretic of years for evolvaluelest broadlession of Egypt, Batyles, and Assyris, purily into the very details of dally life while the local extent of blaterical research has leen searly doubled, the whole of Asia (India, China, Japan), America and Oceania, having been added, with their most at cleat as well as recent lifetury, harizalte of the patitical aper teens, languages, literatures, aris and folklore of their labeld tants. In the realm of natural science (motogy and botany), thousands of extinct species us revealed by paleoutiday; re been added to thousands of calsting species, and the fi ing organisms known to man have grown energousit through addition, by the microscope, of further theusends of infin itely small beliage so far facishie. Not has the number of ercress daily teorgist to light or that of ete facts with the increasing discoveries of new elements and combinations of old ones increased at a less stapendons rate. Pro cress has been made in all fields of human knowledge, and new nces are first springing up. The mass of our kn weighing heavily men as, accumulated facts are describing of air and light and hungering our free d Became of the energoes amount of knowledge to be abserted the youth of our colleges is fast looking the faculty of atilisin the knowledge thus acquired. Nearly half the life is used in to petitus ready for life. In a recent paper, I'v. M. Golibo

suggests a principle which would seem plone to allow men knowledge to be classified for treaty reference, thus doing away with any need for a stortle exertic of memory. The lifes, his a sense, is already corried an to an American lose-leaf encyclopedia, the politicher of which supply new pages to take the place of those that pro obsoirle the Guidatein's principle inflords a means of reconling all facts at present known as said as those to be discovered in fature, with the same safe ty and once us though they were registered in our mem cey, by providing a material correctionedly, have ly kept aterest of the state of hinem knowledge Scientific education thro would consist, in future, much from Importing a knowledge of the outlines of a given science or doctrino, of irrediting how to use this curred partie and how to add to its (resource by personal work. It will be a question of audenticother and knowing "how to do things," rather than knowing a most of Individual, often allocamented and moires fact Kalethy encyclopedias are ecidently imagened in their bookist starmeter, and are descend to become antiquated by the time they are completed. The conof a book are necessarily humorable and any thus in contradiction with 185 which is morable, in inand flow. Books are well adopted for recording a finished system, exposing an established ductrine or life etary week. In the case of a mere storehome of facts, the infinitely more mobile form of the card old however be subplied, possibly, we might sold to the culbur's suggestion in conjunction with Dr. Gold d's Mercebolographie Library system

A Bibliographic Center would have to be created which would be kept abreast of any vactation in the actual status of farmen knowledge by permanent collab orators chosen among the connectent reco ruch brasch

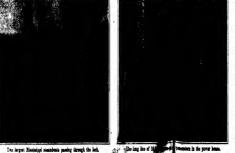
This Central Institute would have to prepare from the information thus received, periodical supplement and recification cards to be sent out to subscribers as given intervals, in addition to or in the piece of their old Information cards

This nexel exceptionally would prove other thene show the advantage of renewing libert periodically, like a human organism, and of never becoming antiquated A glance at the newly-received index curds would keep Ividual investigators permanently admost of all the is being done in their tropestive fields. The encyclepedia would serve on one hand as a reference work ensiding anybody to nequire the most exhaustive in s desired on a given subject, more supply and completely than by means of any existing tool. On the other hand, it would give of each schene or doctrize in its whole or any of the parts, a system line so that even those unequalited with the healing facts might be able to oldala beforments

The suggested encyclopodia would of course nilow of any subdivision, so that only the large libraries and State institutes would have to obtain the whole work, subscribing to the whole information service, individunia being content while the weilors of special importance for their own needs

#### Military Aviation in Italy

E learn that the Italian experience has entered 10 aeropianes with a view of giring rapital innce to this amendon. It is stated that all of the will be constructed in links, the greater part of securio of the Memori, Rivid, Forman and Brisio fras. Of this last make their are along 30 marbiture ordered. A good number of the above muchilies on already in construction. The military commission received 14 normpleanes not long since, and the coming army concerne is to furnish about 19 more Contha all the above, the aerophus feet in itsh will som be increased by 130 units, and at the same time the governefament is taking steps to secure all the power wators and other material for making up the arms aeropian sections, each of which is to inve-6 aeropianes. No doubt the serotions sections or compa will be organ last after the pian which proved so successful in France, that is each of the 6 necessaries has one process wagen to earry the naterial, stores and space parts and this tows a trailer can reminishing the acresions Headed by the officer's cut, this makes a travelling camp which is set up to the open air or travels over the road, accompanied also by special reputs shop cars Turin has been chosen as the leading aviation center both for practical and scientific work, but the arms also arge acrodicanes at Mirafleri. Veneria Resile and St. Maurice. The Royal Industrial Number has just nited a mader of avlation inhomorphy which will be used for teeling of motion, prodyments work and like, and all the offeres of the presentle corps will take part in these operations. Accordings for the army are purchased out of the credit social in Purifiment or with the sums raised by national andand the Aero Club of Italy has charge of some of these latter expenditures. On the whole it will be seen th accopians matters are very active to that country





#### Machine Cut Herring-Bone Gear

Title advance which has now been made in the way of producing double ber-ring-hane gear wheels for all kinds of industrial use is well illustrated by the remarkable specimen presented herewith, and it is also an example of the way in which gear manufacturing is becoming-specialized. The factory where the gear made has gear-cutting machine stalled for cutting herring-bone gears upon wheels up to 30 feet in diameter, and rolling mill pinlons of as much as ten feet in length Within a recent period the advantages of this class of gearing have become more and more appreciated, not only for use in rolling mills to transmit the large amount of power needed for the rolls and at the same time be able to stand the very severe shocks arising in this kind of rk, but also in the navy and other fields where the use of electric motors is now becoming general. This kind of gearing is in fact well adapted to work in a numher of cases where a large amount of power is to be taken from an electric n tor. In view of the increasing demand for the gearing, the factory above referred producing herring-hone gears, and owl to the specialization of this work, it is no to the specialization of this work, it is now turning out gears of high quality and precision. In consequence, the French navy is now making use of these gears largely. They are used upon a number of the battleships of the fleet for driving some of the muchinery on board, for in-stance the "Taris." "Lorraine," "France" and others. They are also used on board four hattleships of the "Verite" class and also on two crulsers for the machines of the rudders. For this same purpose they now applied on submarines such a "Emeraude" with great success are also employed in the Transvaul mines where 31 gear sets serve for electric winches of 250 to 600 horse-power, and 23 are used for tube mills

#### "Baboon Face"

THE photograph berewith reproduced shows a portion of a log of dogwood (cornus fordia) which counts in a peculiar growth. One might suppose that it represented a crude attempt at a carring of the face of sin ape. But the specimen is a natural reask and its represented just as it grew on the tree; without the help of the tool. Such formations are not un-common and are known by lumbermen as "huboon face." The particular specimen here shown is unusually striking. It was cut from a tree in Mississiph.

#### Novel Colorado Hydroduct

THE accompanying illustration shows a novel sheet metal hydroduct over the main line of the Chicago, Hurlinston and Quincy Rallinoud, near Keenburg, Colo. The diameter of the finme is 7 feet and the height above the ratil is 20 feet. Constructional details are shown in the line drawings which are longitudinal sections at a Joint. The expansion Joint used is as simple in construction as the regular wedged Joint between sections. It has no rivets nor solder, is efficient, easily exceeded and requires no more room between stringers than that provided for the waterway.

The two meeting eads A and B are bent to form groves which are nosted one within the other. A bar C, shaped to fit the curve of the hydroduct, is received to receive the grooved eads A and B, then a wedge D also curved to fit the semi-circular hydroduct is driven into the groove fastening the eads A and B to getter providing a smooth floor for the water to flow over. The metal sheets are wedged and not simply "clamped" between the Johnt bars, and the weight of water carried by the metal sheets, is supported on each side of the Johnt by the wings of the bar C, to the public where the sheets are bent downward. The wings are sheared from each end of the bar C, teaving a round section which is brassied and when the muta are drawn tight on each end, the wedges are 10 a forced on the carried when the muta are drawn tight on each end, the wedges are 10 a forced down

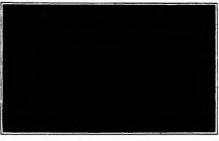




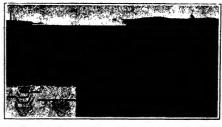
erit i

Enormous herring-bone gear.

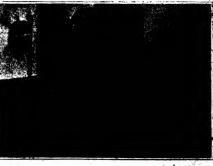
Sorting slabs according to gage.



A "baboon face" on a dogwood log.



Sheet metal hydroduct with simple wedged joints.



Machine for awaging automibile wire-wheel against parties. porfeit stems

of the plant of th

The apparatus is extremely simple in operation and can be handled by any maskilled workman and even by a child. The operator simply presses each piles or sale against the intright, then, solting, the mechanism working. The upper ways of the plate, in fact, bear against a per time interpretation works. The supper ways of the plate in fact, bear against a per time interpretation works. The supper ways of the plate as a foreign the plate as the which sets a great duck moving. This crank disk in fact leads to the plate as the place as top more or less, the places a stop more or less, the place as the plate and the plate is provided in the state of the plate. A printing skyle fitted with types is moved on more we less, in accordance with the deflection produced by the plate, and stamp \$66, speries, pounding figure on the plate. This statishment he sorting to be checked at any monastic.

duced by the plate, and stamps get, esperaspouding farror on the plate. While atthems the sorting to, be checked at any mouself, More than 19,000 plates can be, sevedap per day without any excessive strain. In order further to facilitate the work, the machine, unlike the arrangement represented in the accompanying fayrre, is mounted on a small rolling bench or which the workman travels along from heap to beap.

#### Machine for Swaging Automobile Wire-wheel Spokes

A MACHINE that will take wire from the coli, straighten it, form it into apokes, avaging the spokes between butter and mechanically cutting them off to lengths after awaging, is depicted herewith. The coll is aboven in the extreme left of the engraving, and passes through a straightener of the rotary wheel type. It has office steel eyesles mounted with ball bearings in suitable holders and bearing yieldingly and revolubly against the passing wire so that there is an marring of the surface. The wire from the straightener enters the swaging machine through a hollow spindle fitted with disc. These dies close automatically over the wire after allowing the portion forming the butt to pass out of them, when they impact in another of sharp clean-blog-simultaneously from diametriscity opposition of the section reducing the stock rapidly and, girling it a sort of "hammer femper." The dies then open gain astematically, allowing the portion of wire forming the opposition butter to pass out of the machine proposition of the machine head and draws the wire through. By means of the varied due spokes, in the varied tors poshes of different size. The varied tors spokes of different size. The wire rational strains of the strains, so the strains of the

# Inventions New and Interesting

Simple Patent Law; Patent Office News; Notes on Trademarks

Electrical Fire Protection L'us new problems to solve, new obstacles to overcome and new dangers to

face, and one of the most dranded of these: is the danger of fire.

The trend of growth of the modern city is vertical. Instead of extending over a greater area it is a practice to go to a greater height and depth, and therein our medern danger from fire becomes most instant. The tendency of a fame is to rise, due to the air currents, and in providing suitable sixparapers for our modern office buildings, and business establishments, we are at the same time comtablishments, we are at the same time cor stances such as the recent Triangle shirt ory fire in New York city, bring this situation very forcibiy to our notice. No problem of fire risks, and the mod tendency has been to insure heavily and thus apportion the lows among a great number of people. But this matter of in-surance, if closely analyzed, will show how preposterous it really is.

now prepoterous reastly is.

First of all, to insure a risk is to admit line as 1850, only 83 towns had these asyopenly that due care and diligence cannot
tems. (The sixteen towns so equipped up
protect you. For instance, it your autoto 1800 were: Boston, 1652, Bethlehem, mobile had the common habit of running Pa., 1754; Proviout of gasoline, you would not think of dence, R. I., 1772; out or gasonine, you would not think of dence, R. I., 1772; taking out incurance against this possi- Geneva, N. tolilly. That would be the most open ad- 1787; Nalem, subston that you did not know how to Mass., 1785; Plymeet the difficulty. No, you would proceed to 1810 the task again whenever you Hartford, 1796; found the supply was low. For after fill- Portamouth, Woring the task it is outtle objects they come content to the content of ing the tank it is quite obvious that some time will elapse before it is again necessary, but not so with the fire danger. It body, New York sary, but not so with the me danger. It body, new loss threatens every instant, and nothing at city. Morristown, present can forecast the occurrence, so N. J., Lynchburg, every time an owner takes out fire insur- Va., and Winchesevery time an owner takes out fire insur- va., and Winches-ance he admits that he does not under ter. Va., 1799; stand how to cope with the situation. The New ark. N. Y., fact is no one does. There is at present 1600.) The bucket no very competent protection against fire brigade and the

The fire risk is very expensive. An then the only eminent authority (Gorham Dana, man means for fightager of the Underwriters' Bureau of New ing fires, and no England), puts our average fire loss in regular organiza-property alone as \$500 per minute night tion was effected. and day. That is an average yearly loss With the adver of 250 millions, due to fire alone. To this of the water ments, insurance companies, protective de. This was similar to the modern fire engine

to capture the man who can devise s To capture the man who can devise some is, no means crimet way, some means to meet this condition of for quickly and cut down even in a small percentage this enormous property loss. Furthermore, any device which prevents actual fire losses, at the same time saves insurance presumens, so that the reward will notifying the variebe direct and sure for the man who can salve the problem.

There is besides a humanitarian standward that the matter of fer procession, the most of the thing the results of the procession.

point is this matter of fire protection, tem only. The lose of property, however enermons, difficul rae sees of property, however enermous, difficulty was cannot be compared with the loss of hus solved by the elec-sion lives every year because of the lack tric telegraph. Al-ort delicion, fire protection. Consequently, though the tel-fames is an added incentive for the solu-ction of this problem.

Trom the certifiest times, water has been 1833, and un ale temple the residently fire and on the mount of the contract of the con-

to extinguish fire, and at the pred public at the lat-

sate day, it remains the chief and practer date, not use a SQF organ vs American inside on color still sixteen Pears was given by the same of the same

tically the only general means at our command, Bebye he beginning of the sine-tessenth searray, the only protective sys-tems were buckers filled with water or teams were buckers filled with water or teams described at convenient stations. In some instances, and especially on ship-tohard, pumps were installed and used, but tion of the electric telegraph and the the general use of pumps has been of a lessen fire engine a great advance was

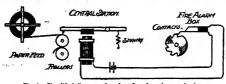
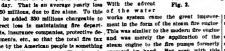


Fig. 1.-Simplified diagram of modern fire alarm box mechanism.

comparatively recent date. Water are made in the art of the finishine. But the team were practically unknown. It is in the start systems were very inefficient and too costly to maintain in any lint a large city there were but sixteen places in the Inigrovements were soon inside, and as Initied States that had water works. As only as 1850 Mesers. Farmer and Chain ning brought out the modern fire niarm the Morse system, wherein n wheel with

cester, and Alhand pump were



partments, etc., so that the total first are and was merely the application of the horne by the American people is something steam engine to the fire pumps formerly like 600 millions per year. This is truly powerful instrument at command a very powerful powerful instrument at command a very second of the control of the Fortune is waiting with a noose of gold serious defect existed in the system That me is, no means exist-

difficulty was

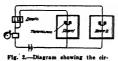
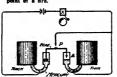


Diagram showing the circuit employed in finding the starting



-Form of U-shaped thermo-town diagrammatically in

mitted to the may be added 350 millions chargestole to works system came the great improve- proper engine house, either by hand or by an automatic repeater

This system is now in use in nearly every city in the United States. The ac-companying engraving illustrates the appearance of the apparatus on its orns mental post at a street corner. The code wheel is arranged to be driven by a clock

spring and me whole is contained in a weatherproof iron box or casing. Access is the releasing houdle by unlocking the outer door the key to which
is usually contained in a small iron box with a glass front This be broken to se cure the key for unlocking the box

periphery acts up

on a pair of con

tacts to make and break the circuit

according to a pre-determined

code, n simplified

diagram of the

ployed is shown in

Fig. 1. Each box has a different

code wheel so that

Central can tell

by the code mes suge from what

box the signal was

ordinary Morse

printing register

at the central stu

tion records the number and the

sage is trans

This system of fire protection has an inherent defect. It is neces sary for the fire fighting apparatus

ance to the fire after the detection of the blaze and the delay occusioned by finding a fire alarm box and operating the same Even theu, after the fire apparatus hus arrived at the box, it is necessary the exact location of the tire and to conect the apparatus to the nearest hydraut Although the modern fire departments are remarkably well orgunized and the men are carefully trained to do all the neces sary work in a surprisingly short time, still it is a fact that this system has a disadvantage of losing the first few mlp ites of time when the fire is just starting, and when it could most easily be quenched. To ald in determining the exact location of fire the electric enunciaor has been very widely installed. This is an arrangement for indicating at a central point the hullding or the room lu which the fire has started

In fact, as early as July 25th, 1846, a patent was issued to an inventor by the name of Addison Smith of Perrysburg The diagram shown in Fig. 2 1. a sketch of the circuit employed, and at ough the latter is remarkably simple it is as complete as many of the modern lustallations. The patent exhibits a very efficient form of thermostni which is shown diagrammatically in Fig 3 brass cylinders made nir-tight are con nected to it tubes which are partially filled with mercury in the nature of the well known air thermometer. The right hand cylinder baving very thin walls heats quickly, and the air expands, forcing the nercury up to close the contact at the point "A," whenever the room is heated quickly as by fire. The other cylinder has thick walls and heats slowly, and in case of a general dangerous rise in tempera-ture the contact at "P" is closed and the ularm "X" is rung and the appropriate drop is exhibited. Substantially the same scheme is widely in use to-day.

In about 1875, another important step

was made to overcome the defects of the central fire station system. The so called sprinkler system was invented. In this system, water pipes are run along the ceiling of the rooms of the building to be protected and about every six or feet apart an outlet in the form of a spray rect apart in outter in the form of a sprint mozzle is provided. This nozzle is closed or shut off by means of a fuelthe plug usually nn alloy of metals. The plug melis at about a hundred and sixty degrees The water in the pipes being con-stantly under pressure, is forced out and sprays or sprinkles the space below it for in area of about 40 square feet the usual space supposed to be protected by each nozzle. This system, when prop-erly installed is claimed to be very effi cleut, and it is stated on reliable authority that about ninety per cent of fires orig hating in buildings protected by sprink lers are automatically extinguished How ever, this figure is very misleading. The grent difficulty is to keep in suitable working condition the complicated system of pipes and valves. There is constant danger of leakage or tumpering with the plipes by unauthorized persons. In event of an actual fire unless someone is at hand to simt off the flow of water, the sprink-lers will continue to flood the building So, although the fire is put out the dam age from water becomes excee The cost of such systems is very high

It is estimated that the average cost per sprinkler, including the necessary piping, valves, and sprinklers, is about \$30 to \$40 This is exclusive of any meter equipment or siarm devices. This high cost is par-tially accounted for by the utilitude which the management of water companies evince toward such installation. It is a peculiar fact that a regular charge of from \$25 to

(Concluded on page \$17.)



Mastric system fire slarm station

THIS U-S-L Electric Starter shows correct application of a correct

of the automobile engine while the "armsture" is bolted to the crank-shaft in place of the engine's fly wheel. With the turning on of electric course,

in place of the engine's fly wheel. With the turning on of electric current, the "armature" revolves and thus starts the engine.

There is no "connecting lever" to throw, because the U-S-L Electric Starter is built as an integral part of the engine, direct-ensemented.

As there are no gears—and only the "armature" moves—the U-S-L Electric Starter is nouseless. As the "armature" is the only part of the starter that moves—and as it utilizes the crank-shaft bearings—there is nothing about the U-S-L Electric Starter to need oiling. The only points of frictional contact are where the "brushes" meet the "commutator" and these "brushes" are, of course, "self-lubricating.

Being especially adapted to—and built for—each type of engine to which it is attached, the U-S-L Electric Starter is always amply provided with power. It will "spin" the stiffest engine, turning it over at from 150 to 400 revolutions per minuse.

with power. It will "spin" the stiffes to 400 revolutions per mitute. When the engine attain's certain speed to 15-1. Electric Starte becomes a generator of electric current. It then recharges the battery for further earning and also provides your cut with light. Some street for further earning and also provides your cut with light to 15-1. Electric Starter, Some or later you will decide to buy only case equipped with this starter—furt, because it is infalling—strend, because of the simplicity—this, because it no moletan—faurth, because of its lightness—and swowth, because of the simplicity—this because of the simplicity because of economy.

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RECENTLY PATENTED INVENTIONS These columns are open to all patenties.

The notices are inserted by special arrangement with the inventors. Theme on application to the Advertising Department of the Sciencism (AMBRICA).

Revisions to Appared.

REILT-PLACKET PARTEMBRA—1. R. Presuranta, 112 Cyder St., Rochery, Boston, Mass. This placeft statemer is arranged to cause the edges of the placets opening to close upon each other without sgs., it censists of two flat members, one of which is provided with hooks adapted to catch under the other member, and thus provides a continuous closure of the placets.

the placket.

HAT PIN GUARD -- L. RECHTSCHAPFAN.

Manhattan, N. Y. N. Y. This plu is arranged to permit of quielty and conveniently pington the same in position on the end of the plu, to protect the point of the plu when the latter is in use for fustening a but to the head.

Ellectrical Bertees.

ELECTRIC SWITCH. (FILUT BURNAKER,
AND TITUE LIKE.—D K. Monar and G. A.
Lersa, Carline Works. Lockwirer Lam. Cor-estry. England. This levention relates to writches or circuits the combination with a tension member adapted to be hested by a current passing through or around it and means for retailing the switch or the like in controlled occlusions. The switch or the like in controlled occlusions with the weeker of which the transformers is adapted to seart or modify an approximately edoon pressure and which can move through a certain angular distance on circuit side of a ded center.

#### Of Interest to Farmers.

Of Interest to Parmers.

IIAN PRACEER.—I. A. DANILLA. Nimeon. Not Ju this invention seems in provided for permitting the draft satisfied to travel in the formation of the property of the property of the property of the provided for returning the fork to original position and for exhibiting the fresh to original position and for exhibiting the fresh to original position and for exhibiting the fresh to original position and for exhibiting the provided for the property of the

NEEDLE-O. D. Bell. 217 Festimore St., Rrooklyn. N. Y. A needle for fastening on large battons in beavy garments has been provided by Mr. Bell's invention. It can also be used for fastening on price tags. The needle is provided with a clamping element in the form of a resilient earn which boids the thread.

form of a resilient arm which holds the thread. TURACUS-UTING BOX -W. E. Rosrras. Ja. Henderson. Ky. With this cutter a retail merchant may conveniently handle tobaccom to the control of the cutter and the cutter are considered by the control of the cutter and the cutter are considered by the cutter and the cutter are considered to the cutter and cut

It directly to the merchant METHION OF MAKING COLORED PHOTO-GRAPHIC ERPRODUCTIONS.—J. Lawmonn, Manhattan, N. X. N. X. The lawresting per tains to a process in which use is made of the original bise color of a bise-print reproduction as one of the ordinary spectrum colors, and one is also made of red codes for the red and one is also made of red codes for the red and colored to the plant of the red and the red colored to the red and the red colored to the red colore

BALE-THE BUCKIE.—E. A. FRANCE. care of Frants Buckie Co., Westherford. Tomas, This lavention is an improvement in hele-the buckies and has for an object to provide a novel construction of bushle formed of a largest

COLD DESCRIPTION TO A CONTROL OF THE PROPERTY OF THE PROPERTY

strain or stretch on the calcular.

LOCK.—S. Eccatorar, "Broadlys, N. T.

N. T. This interaction has referently by Comparing the Comparing Compari

lock in which it is impossible to sick the SAPETE RAGOR.—L. SIEVEN, Makish N. Y., N. Y. The inventor provides is for adjusting blades with reference to the to be performed; provides a construction adapted for packing within small com-and provides a construction arranged to tate the necessary cleaning of the tool.

#### Machines and Mechanical De

Machines and Mechanical Bevices. FIRITY RINER.—L. B. RINYER. Dunklin. Fig. This device automatically separate fruit such as orange, graps fruit, ismons and the like into lois, each lot containing fruit of the same size. The device is positive in actions, and will size the fruit without counting their to rub against one author.

to rub against one another.

REWING MACHINE ATTACHMENT.—L.

BOREMAN, Mashattan, N. Y., N. Y. The intention here is to provide an attachment for
moring a parties of the pocket strip to one
side so that the corresponding needle misses
the said strip portion with a view to provide
a side entrance to the pocket for the insertion
or removal of a sky.

#### Prime Movers and Their Acce

Prime Mavren and Their Accessories, 1972AM (INNEADATOR—11. A. Transmit, 15, FR. Davis, and A. J. II. Transmith, respectively of 50 Newton Rs. Carry Hills; 28 Camberwell read, Camberwell, and 30 Newton Rs. Carry Hills; 28 Camberwell read, Camberwell, and 30 Newton Rr. Surry Hills; 28 Camberwell read, Camberwell in Newton Read (Newton Land) (Newton Read (Newton Land)) (Newton Percentage of the State of the Newton Read (Newton Land)) (Newton Land)) (Newton Land) (Newton Land)

the working of the generator.

GAGE COCKS.—T. W. Gustrin and C. J.

BATHERRA. 211 Rout Dak Street. Rapsigs.

Obla. This page is of such construction that
when associated with a boiler in operative position it may have tile entire construction away
without disturbing the valve spon its
seat. Hence it is particularly adaptable for
use on locomotive where accidents are liable
to occur which, with the bossis page cocks.

might result in the everps of scalding streen
into the locomotive role.

#### Railways and Their Acco

Mallways and Their Accessories.

NUT-LOCK.—E. G. Davis, care of Winner
T. Foz, Citisens' Trust Building, Jefferanoville.

Ind. in this nut-lock a weather in employed
having a polynomal eye adapted to embeace
the nut. and a second relatively fanch boit wash
or formed to engage the adjacent fish plates
so as to hold the bolt washer against turuing,
the respective washers having interlocking
parts.

#### Perining to Vehicles.

Pertaining to Vehicles.
RESILIENT WILEEL.—O Dearyst., 2816
East 27th 8t. Oakland, Cal. The Investina
provides a plurality of realized members and
a surrounding and cvacting spider and frame
properly in place and present a substantially
rigid attracture having a resilient radial action.
The parts are made substantially as duplicates so that any number may be assembled in
a studie wheel and thus present a wheel of
any desired strength.

Norz.—Copies of any of these patents will be furnished by the SCHMYLFIC AMERICAN for ion conts each. Piesse state the name of the patentee, title of the invention, and date of this paper.



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iry No. 9114. This enquirer is in the epstented acticine which he could pullfacture with an investment of from 200. The name of the party will be so our resders on application. by No. 9116. Wanted the name and cover measuracturing novely ink wells

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appeal to the public where capitalities and in
territories can be arritated for boils to all
trade and through sub-agends in a house-so

#### Electrical Fire Protection (Concluded from page 215)

\$50 is demanded of every four-lack cor on made to the city mains. This is exclusive of the meter rent, which the owner is also forced to pay. Now the man who installs the most efficient form charge merely for being connected to the city mains. The owner of a building with out such protection is not required to pay our such protection is not required to pay any charge whatsoever, but can demand the installation of fire hydrants at his very door. Yet in the case of fire no charge is made for any amount of water required to be thrown upon his building, and such quantity of water is very much greater than would be required to extin guish the same fire by means of the auto-matic sprinkler. So in the case of a maowning, say, a \$100,000 factory or building who has expended about \$20,000 to ade quately protect the same, a charge for every drop of water used is made. The ovident man, disregarding the safety of the community about him, is charge absolutely nothing for the water that may sary to extinguish the fire in hi bullding.

The lustaliation of such protection ma terially reduces insurance rates, but I often gives a false sense of security and the owner will reduce the amount of insurance carried. An incident illustrative of this condition occurred in New York city. An owner who boested of his complete protective system, which consisted of four connections to the street main, were nformed by an inspect these connections were found closed, and, in fact, the valves to the mains had no

Happily the aid of the electric current as been secured to furnish a better pro has been secured to furnish a better pro-tection in the matter of such installations. Instead of having the pipes constantly full of water, and thus exposed to the danger of freezing and corroding, thermostats are placed throughout the protected area, and upon a dangerous rise of the temperature the valves are electrically opened and upon cessation of the blaze they are again closed automatically. By this means flooding is prevented. Electrical contacts are placed at every valve to prevent tampering with the device, and in case of unauthorized cleaures of such valves an alarm is rung at a central point. By means of such improvements a more

adequate protection is secured, but the prohibitive cost renders imperative cheaper means of securing the same ends Future developments along the lines of less cost will show an increased use of the thermostat and other electrical devices which have in the past shown themselves to be the most reliable and efficient means for securing fire protection.

### The Current Supplement

I N a paper read before the Rallway Club of Pittsburgh, Mr. G. E. Ryder deals with the maintenance and operation of superheater locomotives, showing how, by proper attention to certain points in con-struction and operation, this type of loco-motive effects economies over the type em-ploying saturated steam.—Prof. C. J. Tilden's paper on the Kinetic Effects of Crowds is a contribution on a subject to which hitherto only occasional and passing attention had been given, namely, the effect of movements of individuals crowd, upon structures such as bridges grandstands, etc., occupied by them.—1)r.
A. Maverick, in an article entitled "Blun-A. marerick, in an article entitled "stun-ders Made by Nature," shows how the human body, so far from being perfectly adapted to its environment, has a number of natural features that positively invite sease.—A combination of the Ostwald ocess for making nitric acid from ammenia with the manufacture of calcium cyanamide is described.—H. W. Perry writes on Permanent Roads as an Beon omic Necessity.—The third instalment of Lieutenant Colonel J. E. Kuba's article Lestemant Colones J. E. Kunk's arrive on reamportation deals with ocean traf-fa. M. Lesteman reports on an analysis of the place from pages, c phenomenon to the place from pages, c phenomenon



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The Possibilities That Await the Hydraulic Engineer.

By Chester W. Larner

CHESTER W. LARNER is hydraulic employer for the Wellman-Seaver-Morps Company of Eleveland. He has been shrifted with the hydraulic strokes deal try since 1992. He has designed hydraulic equipment for scater power developmen iry ance sove the has designed againstic equipment for scater power development in various parts of the United Histor, Unicion, and Canada, notable among which are the Electric Development Company of Niagara Palla, the Massisippi River Power Company at Kookuk, Iowa; the Urdar Rapida Manufacturing and Power Company of Montreal, the Onitario Power Company, and Shavishigan Water and Power Company, and Shavishigan Water and Power Company pany, Shawinigan Falls, Quebec.

He is a member of the American Society of Civil Engineers, the Canac of Civil Engineers, the American Novicty of Mechanical Engineers, associate member of the American Institute of Electrical Engineers. He is a member of the Cleveland Engineers and College Engineering Society.—Enrota.

for engineering, many lines of work are presented. Construction work is roughly divided into civii, mechanical, and elec-trical engineering, but these divisions an extent that it is neces sary for a specialist in one branch to have a considerable knowledge of the other branches if he is to be a well-rounded It is for this reason that most oral nature putit the last year, when the work becomes specialized Indeed, it is an open question if all undergraduate engineering courses should not be alike, leaving specialized work until the post-

Hydraulic eugineering in its various applications offers many opportunities to the young engineer. The great works of this unture in progress on every hand are constantly attracting public attenti Canama Canal, the great irrigation projects of the West, the numerous water power developments all over the world. water supply systems for large cities, and the improvement of navigable rivers for water transportation, all suggest great present and future opportunities for the hydraulic engineer

People at large do not as yet fully approclite the growing importance of water-power development to the industrial and civic progress of this country. Although the development of water-power in small quantities for various industrial purpose has been common for many years, it was not until the perfection of the alternating current generator made long distance transmission possible, that it began to re ceive any marked attention. The hydranlic turbine or water-wheel has been, from its inception, the most efficient prime mover known, but until long distance electric transmission became a commercia: perceibility, water-power development was rethat time, the power developed had to be used at the place where it was generated. But water-power sites are usually remote from large cities or industrial centers, where a good market for bower exists This gap is now bridged by the long dis-tance transmission line. The fact that a good power site is many miles from a go power market no longer prohibits the de velopment of that power. Plants are now in successful commercial operation, where the power has to be transmitted more than two hundred miles, and doubtle with the further development of electrical apparatus this distance will be materially

try is now in a state of marked activity. uid the development is certain to keep step with the increase in the demand for electricity. Furthermore, the demand for electric power is certain to be far out of proportion to the present normal increase, due to the growth of our population and our industries. Water-power is ordinarily cheaper than steam power, and lower cost to the consumer stimulates the use of electricity not only for purposes for which i railroads, electro-fiended processes, and other power as the electrofiend of wise medium for catching metallurgical work and many other for complete for complete

To the young man with a natural tastever to haul their trains, and no doubt the next twenty years will witness extraordimary progress in this direction. The atuminum industry in the United States and Canada slone is now using several hundred thousand horse-power of electricity. are at present far behind those of Europe, and the next decade will anguestionably be marked by unprecedented growth along these lines.

The young engineer in search of a profit able field for his efforts will do well to consider the opportunities afforded by water-power engineering. Many import nut plants have been aiready built, but no yet the field has hardly been scratched The latest estimate of water-power developed in this country is about 5,000,00 horse-power, whereas the undeveloped horse-power is roughly estimated at be tween 60,000,000 and 80,000,000. Further, more, practically all of the important been extending and increasing their capac-ity ever since they were built. Then again, many of the older plants are rebuilding and modernizing their conjument. This is a continuous process which will never end, and suffices to show that the work of the water-power engineer will not be fin ished even when all of the water-po is developed.

Handling water under low heads and at correspondingly low velocities is a difoblem from handling it under high heads, where the velocity may be as high as four or five hundred feet a sec ond. The tremendous force of such a stream can be appreciated only by those who have witnessed its d structive po It will penetrate solid bodies as fectively as a drill, and in turn is itself nimost impenetrable. It is impossible to shoot a rifle bullet through a high-pres jet of any considerable size, and the blow of an ax will rebound from it as if it wer a bar of steel.

The character of the plant in all its features must naturally change to suit these different conditions. The water must be diverted from the source of supply in different ways and different methods must to convey it to the pow house. The design of the power hou the machinery must vary to suit co tions, and sometimes steps must be taken to regulate the flow of the river by means of controlling works built many miles from the plant. Often the water will be taken directly from the pond or forebay into the wheel chambers, and again it may acted for miles through tunnels or pipe lines to the plant, necessitating elaborate precautions to prevent bursting of the conduit if the flow of the water should be suddenly ch

Such are the conditions which the hy draulic engineer has to face to-day. There is no lack of opportunity and there is no dearth of work. Men of ability and exmce are unquestionably in demand and no man taking up this work at the present time will fail for lack of oppor

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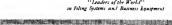
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ore than that, they remain Hupmobile standard because in hearly two years of service they have demonstrated rth is unchanged save for minor detailed improve

rain vision ventilating windshield replaces the type though still hinged at its point of attach the car so that it can be lowered forward if deal The capacity of the gascline tank is increased approxi-mately three gallons.

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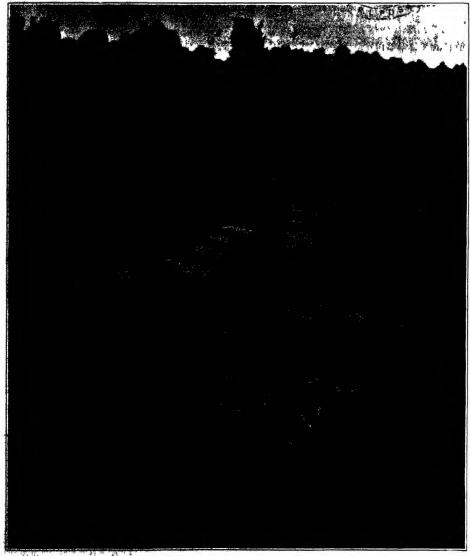
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### SCIENTIFIC AMERICAN

NEW YORK, SATURDAY, SEPTEMBER 30, 1913 d by Munn & Co., Incorporated. Charles Allen Munn, I Frederick Converse Beach, Secretary and Treasurer all at 85 Broadway, New York

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The Editor is always plad to receive for examination illustrated articles on subjects of timely interest. If the platographs are stern, the articles after, and the facts entirelying the control of the

The purpose of this journal is to record accord simply, and interestingly, the world's progress in scien tiflo knowledge and industrial achievement,

### Sir Oliver Lodge's Address

O much emphasis has been laid by the daily press on the few generalizations affecting psychi-cal research which Sir Oliver Lodge embodied in the conclusion of his presidential address before the Birmingham meeting of the British Association for the Advancement of Science, that the profoundly philthe Advancement of Science, that the protoundly pair-coophical and critical estimate of modern scientific achievements to which the major portion of the ad-dress is devoted is apt to be overlooked. To those of our readers who take an interest in this present transition period of physics, chemistry and biology we would commend a careful reading of Sir Oliver Lodge's text us it appears in the current number of the SCIENTIFIC AMERICAN SUPPLEMENT. Noteworthy as most of the presidential addresses delivered before the British Asociation have been, Sir Oliver's unquestionably stands forth as one of the most pregnant utterances that have come from the lips of a scientific man in a decade

Surveying as from a mountain top with the unclouded surveying as room a momentum top with the new science by waging a conflict with the old, Sir Oliver characterizes the scientific period in which we live as one of fundamental skepticism—not the theological skepticism of old, but a deep-rooted skepticism which has all but rmined the long established foundations of scie Scientific men are beginning to ask whether the conservation of energy is always and everywhere vali whether the second law of thermodynamics is n somewhere disobeyed, whether the long known and well-established laws of mechanics hold true everywhere and always, and whether the Newtonian scheme must not give place to something more than a mere approximation to real conditions. Indeed, it is argued approximation to real coloitions. Indeed, it is argued by the new school that we have no faculty for ascertaining real truth. What we once regarded as statements of fundamental, unassatiable truth are now regarded as conventions useful only as quasi-explana-

Against this enshrining of vagueness as an idol to be worshiped, Sir Oliver protests. Much of it was brought about by the tendency to resolve everything into atoms. In that tendency Sir Oliver sees daugerthe danger that scientists may lose all sense of the con-tinuity of unture. His whole address is therefore a plea for continuity

in proclaiming itimself "an upholder of sitimate continuity and a fervent believer in the ether of space Sir Oliver Lodge makes a strong attack not upon recent scientific discoveries, but ruther upon those comprehenive negative generalizations from a limited poview, which are based on such experiments as those of Michelson and Morley on the velocity of light.

He is thus led to decry the principle of relativity.

If the principle of relativity in an extreme sense cablishes itself, it seems as if even time would become discontinuous and be supplied in atoms, as money is doled out in pence or centimes instead of continuously; In which case our customery existence will turn out

organs of sense and no ready response to laboratory organs of some and no ready response to laboratory experiments. While all the law of chemistry and physics may be applied without head to state of the result of contact. Six Oliver some to question the orar sufficient. There can be no doubt that a living thing, while it chey the laws of physics, also initiates processes and produces results that, without it, could not have occurred. "The behavior of a ship firing shot and shell," as Six Oliver picturesquesty puts firing shot and shell," as Sir Gilver picturesquely puts it, "is explicable in terms of energy, but the discrimina-tion which it exercises between friend and foe is not so explicable." No mathematician could calculate the orbit of a common housely, "A physicist into whose galvanometer a spider had crept would be liable to get becomens of a kind quite inexpitable, until the dis-crived the supernatural, I. a., literally superphysical cause." Accordingly Sir Oliver risks the assertion that "life introduces something incalculable and purposeful "life introduces something incatculable and purposeful amid the laws of physics; it thus distinctly appliements those laws though it leaves them otherwise precisely as they were, and obeys them all." He can see no logic in trying to explain psychical phenomena in terms of physics and chemistry. There is a deeper terms of physics and chemistry. There is a desper-menting involved in natural objects than can be ex-plained by the laws of physics and chemistry. There is a real result of the control of the control of the control animals to eat it in order to carry seeds. But these explanations cannot be final. We have still to explain insects. So much cannot be nacessary merely to at-tract their attention. We have return to explain this tract their attention. We have return to recapilat this competitive striving toward life. Why do things strug-gle to exist? Surely the effort must have some signifigie to exist! Surely the effort must have some again-cance, the development some aim." Scientific men are too prone to confine themselves to the mere machinery of existence. Because that machinery obeys all the laws of chemistry and physics, Sir Oliver finds that scientific men are blind to its other functions. "Science may not be able to reveal human destiny, but it certanly should not obscure it.

### Taming the Chagres River

HEN the United States Government entered upon the construction of the Third upon the construction of the Pazama Canal, it was realized that the most difficult physical problem confronting our engineers was the turbu-lent ('hagres River. A shallow and gently flowing lent Charges River. A shallow and gently flowing stream in the dry season, the Charges, fed by the heavy rains of the west season, is liable to become transformed within a few bours into a mighty torrettial river, with a flow comparable to that which piesses over Ningara. Falls. The calar runs approximately north and south: the Charges, flowing from the seast, intersects can cannal, approximately a fiv mid-length, and, at the

canal, approximately at its mid-length, and, at repoint of intersection, turns somewhat abrupily to the north and flows in a course generally parallel with the canal, to discharge into the Athantic Ocean. Manifestly, any plans for the building of the canal had to make ample provision for controlling these stupendous shoot waters and guiding them nafely to the sen. Under the plans for a sea level canal under the sea. Unuer use pans for a sea sevel chast under the French régime, and later as proposed by the minority report of the International Board of Engineers, it was proposed to construct, parallel to the canal, a large artificial channel, capable of carrying the Chagres floods clear of and without interference with the work of excavation—a stupendous and hazardous probitself. Under the plans for the lock canal as now practically completed, the bold project was conceived and successfully carried through of building an enormous successfully carried through of building an enormous dam across the Chapter Valley mear its Attantic end, and providing at its center a spillway opening, through which the food waters could pass unobstructed to the Attantic. Taking advantage of the dry seasons when the flow of the Chapters is insignificant, this spillway opening has been gradually closed by a dass of solid concrete, provided with suitable openings controlled by gates through or over which the flowd waters have passed in the rainy season. At the present write, the suitable varies are closed, and the core resultive. spillway gates are closed, and the once greatly dreaded Charges, transformed from 700 to friend, is performing its quota of the work of canal building by the formation of a vast inland lake, nearly 170 square miles in extent, which will afford some 20 miles of

miles in extent, which will afford some 20 miles of deep water navigation across the lathnus. Those of our readers who have had the good fortune to visit the Pannam Ganal during its construction will doubtlebs remember that when they reached the north-ren end of the Culeira cut, the train passed over a steel bridge about a quarter of a mile or more in length, which served to carry the tracks across a rather broad and shallow stream. This stream is the Chagres River, and the point of crossing is located where the Chapter an area case our customary existence will turn out to be no more really continuous than the events of a kinemantagraph screen, while that great agent of constitutity, the ether of space, will be relegated to the numerum of historical curtodities." That would indeed mean "the most fundamental revolution since Newton." Sir Oliver protests against the present denial of the existence of anything which makes no appeal to this, it follows that unless, some provision had been

made for preventing the feet made for payenting.

Culciving cut, the lattice would have bent a
the flood season with from 10 to 10
log the time of seasoning time. To see
artificial subsalanting, there as the Cambre
built from the railread continuous oute from the railress essential action the ound to the opposite side of the opin diche has served to keep also cut they desired of the exercised. The destricts of the exercised to the exercised through the bottom of the dike, through the bottom of the dike, through water has been drawn has

through the bottom or the size, Through where he water has been drawn by a pumpling ignest one structed specially for that work.

On September 18th all steam shovel, work were was gaspended in the Oulebre cut, and the conscruction such steam shovels, drills and over thirty-six undee of tracks steam shorels, drills and over thirty-six salles of treats, in now boing removed from the cut, prespectatory rie flooding it with water. The last work of the drill should be such as the present of blasting the six or severe handless thousand cutule yards remaining to be lating out of the bottom of the cut. This materials will the bestoom of the cut. This materials will be reseasoned by floating drudges, when the cut has been fijled with water. But if dones steam shorels, will be materials at root on the seek bank and four on the week bank; contribution of the cut has been fijled with at root on the temperature in the contribution of the seek bank and four on the week bank; and four on the cut has been fijled with the contribution of the seek bank and four on the cut has been fined with the figure of the banks to all the seek.

and diminish the joudency of the basile to silfe first-the caind.

The plan of operation for filling the cet is as fol-lows: First, on Cookee 6th, the four 28-tech five pipes through the 6the will be opened, and the water from Gatun Lake, which on Angust 28rd stood at 881. The feet above see level, will be permitted to feet stoo the cut for five days or notil Cetcher 10th; on which day

aut for 4ve days or nattl October 10th; on wylich day the Gambon dike will be drawminted and the intelle-er of the catending from the dike to the upper lock gather of the catending from the dike to the upper lock gather. The final act in this great engineering drawm will be played by the two coronom fourting dreades, the largest ever built, which have been constructed for the purpose of westling with the gigantic sidies of the delvie of the Gambon dike, and then, proceeding through the cut, they will france the processing through the cut, they will remove the broken rock, at the flast blacking above referred to. Having done that, they will attack the huge siddes which have been giv-ing so much trouble, particularly during the past four or five years. These diveleges have a combined espective of 1,200,000 cutch yards per mouth, and they are there-00,000 cubic yards per month, and they are fore well quelified for their task of removing the 9.000. cubic yards of sildes that are new moving into the m of the canal.

And thus the world's greatest work of engineeris will have been completed one year ahead of the the estimated by the engineers.

### "Smoke-proof" Buildings

FIREMAN of long and varied experience in the service of the New York city Fire Departthe service of the New York city Fire Depart-ment recently stated that of the hodies recov-ared from burned buildings, a surprisingly large num-per showed no visible effect even of being slightly secretably the finness, which means, of course, that a large proportion of the fatalities are due to simple asphyxiation. In the Park Avenue Hotel thre of some ten years ago, most of the guests who lost their lives were found, if we remember rightly, without a visible mark of fire upon their persons or clothing.
"So far as the fatal effects are concerned, the poison

ons games that accompany amoke are as deadly to human life as flame. Hence, if the lives of the immates of a tail office building are of greater value than the structure likelf, we should take greater pains to protect human life against asphyxiation than we do to protect the steel and masonry building against fire. But to re both of these results, it is necessary, not more ensured the building itself of incombustible mat to construct the building fuels of incombustible material, but to see to it that everything of a combustible nature in the way of strings and turnishings be most rigidity excluded. If the tons of wooden furniture in the lower stories over three or Rour hundred foot high building were abless, such the products of combustion, the mache and gases, were sweeping upward through stairways and elevator shafts and filling the varieties occritions, what earthly chance would the immates of the upper startes have of getting out of the building before they were overcome by sufficient for the process which has presuitly been made by 2 far. A 5.

All of which considerations give given force to the protest which has peeutily been made by Rr. A. G. Patton, manager of the Special Manards Department of the Sev York Free Immunes Explosure, aspine the plan of the Severi of Bettimate to equip our new municipal building with weeken office Teachtries We have buildings from their bundered to even knieffered Res and more in beights in the eith yorkey. They are forgreed, that is to ear, incombandishs, if is friend better than the several product of the contract of the several product of the several points of the friend the several product of the several points of the first best what shout that containing. For all immunes let the Bourd of Belinstein products and products are medically indicated the product of the several points of the several points of the several products are medically indicated the products and products are medically indicated the products are several to the products of the several products are medically indicated the products and products are several to be producted to the products and products are several to the products and products are several to the products and the products are several to the product are several to the product are several to the products are several to the products are several to the product and the product are several to the pro

Bankensen Trible on the New York Submay—The seed distribute of the New York Submay—The seed distribute of passenger captiol last year by the Interest Hamilton Threated Company and the Year York Submay Suid Microsoft was 884,256,556, an increase over the previously year of over 27,000,000. The geneter gardy of this increase was on the Submay, and it was done yearloopingly, so the increase species of the general properties of the form of the properties of the passenger fines of the passenger over the garyton year of ever one and one quarter million dollars. After a distance State Sta

simplifies year of aver one and one quarter million dollars. Highways hatigin Sairf-driven Street Care.—After a marked study of the motor buses and care of Parts and Enables, the Edithburgh City Council has been advised by its own Commission to adopt sairf-propelled street care in preference to a system either of overhead or of cinduit steets ear service. The Commission reports in ferred of parolibe-electric care, on the ground that the high kilph once of these is smooth than counterbalanced by this givest cost of installing an overhead or underground scales written.

this great cost of instanting an overcose or uncorpromeneally system.

"Ethe Ballways is the United Stetes.—Assorting to the singlishes of the Interstate Commerce Commission for the fiscal year ending June 30th, 1912, there are 240,— 283 miles of track operated in the United States. The examps number of isoconcives per 1,600 miles of line was 286, and the average number of cars was 9,860. The total sumber of persons on the payrolis was 1,969,— 218, and the total wages and salaries paid amounted to 1,248,113,172. The par value of the amount of railway capital outstanding was over nineteen and one half hillio 1 delice.

collain.

Statistics of Railway Accidents.—The report of the Interestate Commerce Commission shows that during the months of Oxtober, November, Desember, 1912, 269 people were killed and 4.334 were injured in urin socidents. Casualties of all classes amounted to 2,67 killed and 61,232 injured. The total ampine of collisions and desallments for this quarter compared with those for corresponding quarters of the four previous years shows that with the exception of 1911, the number has increased of 46.8 per cent over the corresponding quarter of 1908.

A Herreabest Yacht for the Defense of "America's" Cap.—We shall not be surprised if the reduction in the size and cost of up defenders for the paces of next year results in the construction of several yachts to contend for the honors of being selected for the defense of the cup. We are pleased to note that Herreahoff, who has contributed so greatly to the retending of the cup it is sometime to present years, has been commissioned to huitd a 75-foot defender for a syndicate composed of former Commodere Commisse Vanderbills of the New York Yacht Club, J. P. Morgan and Frederick G. Bourca. As usual, Herreshoff has been given a free hand in the matter of the design of the yacht and its cost.

That Revelving Ship Again.—The revolving ship is one of those inventions which, although they are obviously impractioable, seem to have a fascination for the inventor which is rather difficult to explain. Several years ago these was built and tried in this country a boat of the revolving type which, if we remamber rightly, reached a stage as which it was launched and an atempt was made unsuccessfully to propel it. According to a dispatch from London, a Pats inventor is now busy upon another of these craft, and judging from the meager descriptions available, the designer is following along the lines that were proved to be altogether impractisable fully a drone years are:

fully a dozen years ago.

A New York Central Safety-Enhibit Car.—A safety-sahibit car, for use in connection with the work of the safety department of the New York Central Lines, lase recently been put in service. It will serve as an instruction car, in isseabling the principles of 'eafety firet' to the employees of the railroad. Along each side of the car are models of the machines used in the different shope to safequed the workman against injury. By means of photographs arranged on the walls, the "safe" and the "unsel" methods of doing various kinds of work are depicted. Other framed pictures show how the contest show that, annuality, over 10,000 Seepassers are killed and injured on the railroads in the United Shates.

States.

German Dreedweaghts to Curry 15-Jack Gens.—It seems to be prestry excisin that the bissay German drend-noughts will be nared with 15-took guns. If so, the German hatcheshape will send the world in the power of the individual units of their main hatestries. The cartisat German hatthiships, exceptionfling is due to our "Oragon," were arreed with a gun of only about 9½ incises salide. The next astrone was to as 11-took place; then in: 8 15-took, which is the gun with which the ships of this extend place; then in: 8 15-took, which is the gun with which the ships of the extend places made and the present astrone or as Te-fraids place with he much larger thing the more entragements of earlier would insideable to the large mind; for which the salidity of the salidity of earlier would insideable to the large mind; and the proposed, the shall for the different gun, will be probably about 1800 persons in weights.

#### icience

The Primes of Monnec, well known for his researches as an oceanographer and as a patron of science, has announced his intention of paying a visit to some of the principal scientific institutions of the United States in Southenheer.

A Deep Bering in Berissisis is furnishing interesting information concerning the geology of that island group. The boring was undertaken by the management of the Princese Hotel, Hamilton, in the vain hope offending water for volcanic origin," as the present local supply is mainly rain water, caught from the roots of houses and strong in citizens, and is unadequate. A depth of over 1,400 feet has been reached. Samples of rook, etc., have been taken at various depths, and one set of these has been presented to the United States National Museum in Washington. Petrographic studies of the material are being made by Mesure. L. V. Pirson and T. W. Vaughan, while Mr. J. A. Cubman is studying the foraminifers for a report on the peleontology.

Matesif's Comet.—A telegram received at Harvard College observatory from Prof. A. O. . Leuschner, of Berkeley, Cal., gives the following elements and ophemeris of Metoalf's comet, computed by Prof. Crawford and Miss Levy, from observations on September 2nd, 3rd,

		EP	HEMER	ra.			
G.M.T.		R.A		De	G.		Light
1913 September	h.	m.	8.	deg.	m.		
7.5	6	41	39	+59	53		1.20
11 5	6	30	52	62	57		
15.5	6	12	28	66	41		
19.5	5	37	43	71	08		2 3
						_	

The comet's perihelion passage occurred on September

The Harmstine is a dry north to east wind that blows in winter on the upper Guines coast in Afrea. While it prevails the air is filled with fine dust. The characteristics of this wind are most easily explained on the supportion that it comes from the Sharaz Desert, and is analogous to the "ghill" of Tripoil. However, the extensive burning of grass which goes on at the harmstian season might account for the remarkable outlines of the wind. In order to help obsides the origin of this wind, Capt. von Seedred, stationed in Togo, has recently collected specimens of harmstian dust with the sid of aspirators and filter-tubes. These were examined in Berlin and found to consist mainly of sillicotus fragments of diatoms, indicating a deservicing. Vegetable sals was present, but evidently the burning grass merely intendifies the initial dustiness of the harmstian.

of the harmatian.

Natural Riseory Manuals for the Philippines.—

Travelers with a taste for natural history who vasit the Philippines will do well to equip themselves with some of the excellent manuals published by the Bureau of Sciences a Manila. These included "A Flora of Manila" which is practically a complete flora of the actiled areas at low altitudes throughout the arbipleago, containing descriptions of over 1,000 species, with artificial keys, selected native, Spanish and English names, and accounts of habitats, time of flowering, and range of all spocies considered; "A Manual of Philippine Birds," containing descriptions of all known species of Philippine birds, with the usual keys for the benefit of the novice, maêtre and English names, information as to range, and in many cases notes on nesting, migrations, and other habits; also "A List of the Mammals of the Philippine Binds, exclusive of the Celacos," and "A Chéck-list of Philippine Fahee."

Cheick-list of Philippine Fishes."

Human Geography and Industry-planning.—In a paper presented before the Birmingham meeting of the British Association for the Advancement of Science, Mr. C. R. Enock maintained that the economic problems before the world at the present time call for the stabilishment and exercise of a comprehensive and constructive science, whose aim would be to evolve and teach the principles under which economic equilibrium in the life of communities may be attained. It was argued that the real science of living on the carth, or "human geography," the adaptation of natural resources and national potentialities to the life of the community, has zeror been formulated. The congestion of the population in towns, the desection of the countryside, the high cost of living, low wages, unemployment, and so forth, are related phenomena, luminately connected with the echieveston and development of natural resources. The axion was advanced that the world is espable of supporting all lies labalitants in sufficiency, and its failure to do so in due to the non-energence so far of an organizing science, whose deliberations would be safer freeze agoistic der partiess influences. It was afficued that the teaching agis poperations of such a science is inconsury if feeded resource and to the humanitations and privite of the same polation to the algebre of things at their corresponding institution do to physical, security in antiention to the physical, security in antiention to the physical, security in antiention to the physical security and extension and other sciences.

#### Automobile

Two Automobile Shock Absorbers.—Two patents, Nos. 1,066,919 and 1,006,920, to Theo. A. Klenke of New York city and Frank N. Bochrich of Jersey City, N. J., sasignors to Klenke Cushion Axie Company of New York city, previde pneumatic cushions supported upon the axies and operating to cushion the vehicle.

Automobile Starter and Lighter.—In patent No. 1005-999, Morris Monkowitz, of Montelair, N. 3, shows a motor vehicle in which the speed of the motor generator can be substantially the same as that of the crank shaft when the motor generator is driven by the engine as a generator to charge the batteries. The power of the motor generator can be gradually applied to the crank shaft during the starting of the engine.

One Hundred Horse-power Gan Wagons for Austrias Army.—New 12-ineh siege mortars of the tubular-rosoil pettern, with the tube 14 feet in lenight and equal to projection, and the tubular should be suffered by the pettern of the tubular should be suffered by the pettern of the suffered by the suffered by

Another Spring Wheel.—On account of the unavoidable, inherent dusadvantages of the ordinary type of pneumate anatomobile tree, designers have been striving for several years to bring forth a tire with puncture-proof qualities, yet retaining the necessary resiliency to afford desirable rating qualities. To this end one wheel manufacturer in particular claims to have solved the problem and will place his product on the market his month. The fundamental idea of the wheel as the carrying of the load on horizontal helical springs connected alternately to the outer and niner runs with ball and socket connections. There are 11 of these springs arranged around the purplayer of the wheel rim in such a manner that each spring carriers 1/14 of the total load on the wheel. When the car strikes an obstruction the shock is communicated through the sholl rubber the and is taken up by the reaction of the belief apprings. The center of the wheel is undo in the same way as any ordinary automobile wheel but it is lateral strength is increased, since the spokes are much shorter than in the small construction.

Meaning of Standardization to the Individual Motorials.

"Unfortunately, the doings of the Society of Automobile Engineers are not advertised as widely as they might be advertised and as a result there are few who appression of the true meaning of the society's activities to the individual owner. One of its landardization of magnetic mountings, or amount of the society's activities to the careful of the society's activities to the society and the society activities to the standardization of magnetic mountings. The mere statement may mean next to nothing to the animatised but a little desper delving brings to light list advantages. If the mere statement may mean next to nothing to the animatised but a little desper delving brings to light list astatistic for it means, briefly, that if John Smith is not satisfied with the magneto on his machine be may substitute for it includes the more of the magnetic delivers that the form of the state of the more of the magnetic delivers the server of the server of an expective of the mean temperature of the server threads at limits any or will the portance of this step to the individual owner list in the fact that he may not purchase at almost any hardware replace one loss the product of the server thread at the consumption of the most important and the importance of this step to the individual owner list in the story or country general story a standard thread and to go for a nut or both c—and then to pay for it in proportion.

The British Treek Show.—While this country has ber motor truck shows every your and in almost every eity of importance, England follows the bolley of exhibiting only every half decade. In the British Commercial Motor Volide Show, which recently closed, at Olympia, the first in five years, the keynote was at Olympia, the first in five years, the keynote was at Olympia, the first in five years, the keynote was considered to the following the process of the second of the foreign the foreign that is done at our own annual truck displeys. England has awakened to the fact that the displeys England has awakened to the fact that the displeys England has awakened to the fact that the displeys of the following the fo

### The Steel Car as a Life Saver

### Telescoping is Prevented by All-Steel Construction

In the recent wreck on the New Haven Bailroad, the heavy colliding engine and train split entirely apart het vor rear wooden steeping cars of the train abead, scattering the wreckage and the helpless passengers to tight and left as it crushed its way through. Over a score of teophe were killed outright.

It is beguing the question to say that had the earbeen of silated construction, none of these lives would inverbeen test; but there is abundance of evidence, drawn from the behavior of steel cars under conditions practically as severe as these, to show that steel construction would have saved the lives of many, if note of the greater part, of the occupants of these two rear curs.

In the event of a newy collision, wooden cars fail, either by golur entirely to phere as in this case, or by one of the massive and strong underframes mounting upon another, and shearing the superstructure of the lower car entirely from its lane. Wooden construction has the disadvantage that, although its strength to resist the first shock is great, one it has given way it offers but little progressive resistance to the crushing and rending energy of the collision; whereas the tough mental of which steel cars are built, not only offers a men's greater resistance to the first shock, but, after the car or cars have begun to give way, the material still puts up a simbour girls to retain its original form.

The behavior of trains of steel cars in collisions shows that the end platforms and weekblues, which are not or should not be occupied by the passengers when the train is in motion, form a natural buffer and "yield-point," and that the first concept of the collision, and generally the whole of it, is expended in crumpting up the veetfluies—furthermore, this usually occurs without uny loss of life

Although the steel our will save its lumates from the crushing hipries which result in more or less speedy death, it cannot sufferment them from the contustons due to the sudden arresting of the train and the hurting of the passengers forward or backward, according as they are in the train which strikes or the one that is run into

These facts are brought out in a report of the Internative Commerce Commission on the wreek at Tyrone. Pa., ou July 30th, on the Pennsylvania Rallroad, in which, although 153 people were more or iess injured, only one was killed. This collision was an almost exact duplication of that at North Haven on the New Haven Hallroad. A truit sainding on the track was struck in the rear by a fast train. Not one car in either train was of wooded construction, and the only domage

resulting was the crushing in of the vestinites. The heaviest damage, of course, was done to the rear car, which was crushed for ten or twelve feet in he rear, while the forward end was jammed for six or eight feet into the rear of the ear sheed. Subsequently to the New Haven wreek, a fast train was ditched near Wyllo's station on the lemaylyania Raliroad on September 9th, and although six steel concless were fluing from the track and turned over in a cornfield, only 35 persons were fluing from the stack and turned over in a cornfield, only 35 persons were fluing from the stack

By way of showing the great resistance the accompanying itlustrations of a wreck which occurred in July of this year on the tracks of the Northern Pacific Railway in the State of Washington, in which three passengers and one emptoyee were killed, and seven passengers were injured. The train consisted of a 200-ion engine, followed by three refrigerator curs, one combination buggage and express car, three day conches, one dlubug car, oue Pullman sleeping car and one observation car, making ten curs in all. The train which was making up lost time jumped the track when it was running at a speed of sixty miles an bon. The engine rolled over into a gravet embankment, and the whole train was brought so suddenly to a stop, that the shock was not much severe probably, than that of a direct The forward truck of the first steel day couch was knocked from be-peath the our, allowing the forward end to drop and causing the rear end of the car ahead to mount the underframe and crush in the left-hand side of the car to

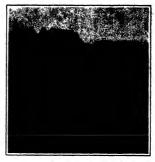
the extent shown in our illustration.

When we remember that this 15 or 20

feet of the car had to absorb the enermous energy of the six rear cars, running at 50 to 60 miles an hour, the great resistance of the steel construction will be evident.

### The Meteorological Service of Australia

BEFORE their federation, each of the Australian Bstates had its own meteorological service, in most cases in connection with an official astronomical observatory. Some of these institutions made



Looking forward from the roof of the dining car.

weather forecasts and even published weather maps, but the work suffered from lack of co-ordination between the states, and was but meagerly supported by the several governments. The main outcome of these rather desultory efforts was the collection of a considerable bod of cilmatte statistics.

In 1897 a general service was established for the whole commonwealth, with headquarters at Melbourne, and piaced under the direction of Mr. H. A. Hunt, who still holds the post of "Commonwealth Meteorologist." Mr. Hunt's first important official set after his appointment was to make the circuit of the globe, visiting kindred institutions in other countries and picking up idean. Since his return to Australia practical meteorology has made great progress in that part of the

THE LEVEL CONTROL OF THE PARTY OF THE PARTY

Observations made every moreling at 9 o'teicis at four bandwel and forty-two stations are transmissed to Melhourne by telegraph. Besides reports from places in the commonwealth, valuables advises are presirved. From the constitution of the constitution of the Atlanctic and Mew Years between Australia and the Atlanctic and Mew Zealand to the south, and Ristavia to the north. Thus the cotal area embraced in the weether charts, which are published both in separate broadles from and in facility energapers, as in the United States, which are published both in separate broadles from and in facility energapers, as in the United States, is considered infector to that above, no United States, is considered in the Control of t

In its method of pregaring forecasts the Assessitian service is unique. Several forecasters work together at the central office. Most of these have had expertence as local forecasters in one or asother of the states, and each is regarded as an expert for his own district. However, each of them writtes out forecasts for all the states, and these are submitted to the commonwealth meteorologist, who prespares an independent series of forecasts of his own. A conference is then held between Mr. Hunt and his staff, and the forecasts that ullimately go out represent the consensus of their opiaions. During the year 1912 about 87 per cent of these predictions were verified.

As to particular phases of the work, there is a special service of warnings for the northwest coast of Australia during the willy-willy season, between November and April, and another for the drying season in connection with the fruit settleneous at Renmark and Mildura, on the River Murray, analogous to that which the United States Weather Bureau maintains in California, A flood-warning service is also maintained, especially in Queensiand, where the rivers are short and torrestial.

### What is Coca?

THERE is no more remarkable plant, if regarded from an economic point of view, than Brithwood coor, although as a plant it is not well known in the hotanical world. From its leaves is obtained a nar-coit which is considered a simulant and tonic and is used extensively in Pern, Reuador, Chiti, Bolivia, and other parts of South America. It is used both as a remedy for various diseases, and also as

remoty for various diseases, and also as a nervous stimulant and restorative. It is said that by chewing a sufficient quantity of coca leaves, a man is capable of dispensing with food for five days without any material inconvenience, even though he is engaged in hard physical labor.

Con leaves, which are small in their fresh state, and light green, are produced by a small shrub shout 4 feet high. The flower is white and the fruit a small red berry. The plant is propagated by seed in beds and later transplanted in the open at the beginning of the rainy season. Cook is grown on a commercial scale, chiefly in Peru, where a crop of leaves can be obtained every four months, eighteen months after planting, and for many years, if the plants are not destroyed by the ants, which are so destructive in the tropics. As soon as the leaves are gathered they are, thoroughly dried to avoid any moisture or dampuses after storing any moisture or dampuses after storing

Brythrogston cocc is a plant which grove in moist and woody regions chiefly on eastern slopes of the Andea. Much attention has been becomed upon its culture, which has increased the supply to such a degree that during recent years many hundreds of thousands of dollars many hundreds of thousands of dollars. Unlied Rates uses large quantities of these leaves annually. The average value of this product used in this country amounts to about \$155,000. At the present time Pers turnshass the olls of the occa leaves used outside of that country. The plant has been introduced, into indials, Orgion, Javas, and other parts of the Best.



Derailment of a ten-car passenger train running at a mile a minute.



This steel car bore the brust of a wresk at 60 miles per hour.



THERE can be no doubt but the increasing adoption of electric traction, though ousting the steam locomotive from its unrivaled monopoly, is indirectly renaible for a number of improvements lately adopted its design. However, a common competitor is now arising in railway traction to both types of prime mov-er, vis., the Diesel or high-compression oil engine, which after its recent achievement in ship propulsion, It is significant of the high development reached by the oil engine that the first Diesel-motor operated locomo-tive should be, not some modest engine designed to haul the student of the same motives engine designed to have a suburban or slow train, but an express locomotive destined for service on the Berlin-Magdeburg trusk line. This Diesel locomotive, the construction and trials of which have been watched with unusual intertriats of which have been watched with unusual inter-est in German engineering circles as well as abroad, was supplied to the Prussian Hossian State Railways by the Geedligheaft für Thermo-Lokomoriten, founded by Mesens. Gebrüder Sulser of Winterthur, Switzserland, Govariment Engiteer A. Klose of Berlin (who is re-possable for the design of the sechanical part of the locomoritee) and Dr. Rud. Diesel of Munich. It has been constructed at the wortshops of Mesens. Gebr. Sulser, who designed the engines.

The motive part of the icomotive mainly consists of

The motive part of the locomotive mainly consists of a driving engine direct-coupled to the driving axles and an auxiliary engine working quite independently of the driving axies. This has an output about 1/5 to 1/4 that of the main engine and serves to generate comthat of the main engine and serves to generate com-pressed air, for operating the main engine in starting, on heavy gradients, etc., with high charges. Moreover, in order to increase temporarily the output of the auxil-lary engine, there have been inserted between it and the driving engine, air tends from which a certain amount of air can be derived during standstills of the auxiliary motor or even while this is working. In Fig. 3 is shown Messra Suiser's patented arrange-

In Fig. 3 is shown Meeers. Suitser's patented arrangement of the driving said auxiliary engines. a is the driving engine coupled to the driving axies b, the engine to meet the special requirements of locomotive operation, being reversible; o is the auxiliary engine which serves to drive the compressor a supplying compressed air through the conduit so the driving engine o, there to be used as starting or fuel injection air.

In starting, the auxiliary engine o is kept working, thus throwing a continuous supply of compressed air into the main engine. The latter can thus be given a considerable inflow, which may be even increased by gupplementary air from the tanks p. Compressed-or purplementary air from the tanks p. Compressed-or operation sions allows the train to be accelerated up

to 8 to 10 kilometers per hour, after which fuel operaproceeded with, the engine now working on the constant pressure (Diesel cycle). There is

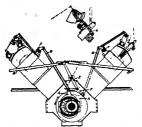
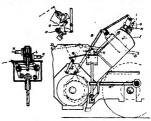


Fig. 1.-The eccentrics and reversing gear.

another means of air-supply available. stead of deriving the whole of the compressed air from e coupled to the auxiliary engine, part of the



Starting valve and gear.

gine and part by the driving engine, these being like ise made to operate pumps.

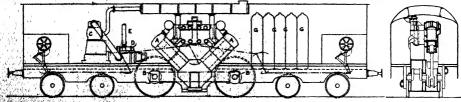
The above is the general arrangement of the Diesel locomotive. In the following are discussed the mode

The express train locomotive herewith represented The express train iccomotive nerwith represented is 16\textit{\textit{m}} interest in length between buffers, and 05 tons in weight in full working order. The coupled wheels are 1.75 meters in tread circle diameter. The driving energy is transmitted from a loose shaft to the coupled wheels by coupling rods designed in the to the couples wheels of the rods are fitted with adjustable journal brasses.

The main frame is of the box pattern. It carries in

its central part the support and driving bearings of the driving engine; this support consists of a steel casting and serves to carry the loose shaft. The motor cylinders are also held by cast steel cross-ties. At one end there is fitted the base of the auxiliary engine. The frame cross-ties, made up of sheets and angles, carry the bogie pivots and at the same time serve as coupling boxes to receive the draw-bars. The draw and buffer gears are designed in accordance with offclai regulation by the Prussian Rallway Department. The driver's cabin takes up the whole length of the locomotive, thus protecting the driving gear. Tauks are fitted into each of the four corners of the locomotive body, those at one end serving to store cooling water, and those at the other cud, cooling water and water, and more at the other run, coming engine, there is situated the exhaust tank; above one of the driver's stands a honeycomb radiator, and above the driver's the evaporation cooler Two pumps, driven by the stands a noneycomb radiator, and anote the orner, the evaporation cooler Two pumps, driven by the main and auxiliary engines, respectively, ensure the circulation of cooling water, the drawing off of piston cooling water and the raising of fuel from the tank.

The driving engine is a reversible four-cylinder sin-gle-acting Sulzer motor, designed on the two-cycle principie. The four working cylinders are set by pairs at an angle of 90 degrees to one another, and all of them at 45 degrees to the plane of the track (in V-fashion). stroke Each pair of working cylinders is situated in the same plane and made to act on a common crank pin, the rods being forked so as to insure perfectly symmetrical effects. The two cranks are set at 180 degrees and are designed to run at 304 revolutions per minute at a traveling speed of 100 kilometers per hour. The crank shaft carries in addition to the two working cranks at the outside two pressed on crank disks with balance masses, transmitting their rotation through coupling rods to the driving axles of the vehicle. By this patented arrangement a perfect bal-



ance is insured between the primary forces of the ance is Distrect netween the primary forces of the reciprocatting misses of the working cylinders and the contifunal forces of the caulty coupling rods and balance misses. Each cylinder carries a fuel valve, a starting valve and two scavenging valves for the injection air (at 50 to 70 atmospheres), starting sir (at 50 atmospheres) and scavenging air (1.4 atmosphere + absolute). The exhaust is discharged through silis in the cylinder wall, which are opened and closed again by the piston. Between the crank disks and the frame there are two eccentries, each controlling all of the valves of one haif of the engine and which can be turned round in reversing the motor, when the traveling direction is to be changed. This is done by means of a special rigging d, a, f (Figs. 1 and 2). The position drawn in full of the lever c corresponds to word running, the position drawn in dots and da to forto backward running of the motor. The motion of both eccentries a is transmitted by rods b to the two lever shafts c, which actuate in their turn valves in the cylinder covers. In the cylinder visibile to the right, there is marked the steer-ing of the fuel valve, whereas the steering of the seavenging valve is limitarised in the left cylinder (on the other side of the vehicle). The steering of the fuel valve is so designed as (a nilow various degrees of admission to be obtained, by altering the posi-tion of an intermediary piece y. The two fuel pumps, the pistons of which (four in all) are likewise driven from the valve gear, are not shown in the figure. starting valve is controlled in a similar manner to the thei valve. Variations in the duration of opening of the starting valve (which are obviously more considerable than the range of variation of the fuel vaive) are effected by turning round the shuft k on which the intermediary piece o connecting the valve gear and starting valve is mounted. In front of the starting-air valve t there is inserted into the starting conduit k another organ l, which is likewise controlled by r and

netnated from the coupling rod m.

The arrangement of two steered organs in the startinguit conduit allows a constant admission of air (preingsuir conduit miows a consumit indimission of air (gas-closis to the entrince of fue) to be adjusted for, while reducing losses due to throttling. With a single start-ing valve it would be difficult to so design the vulve gear as to keep this six admission constant with all gear as to seep this air admission constant with an degrees of adulasion intermediary, as in the present case between 0 and 68 per cent. Throttling valves, on account of their slow opening and closing, would like-wise result in material losses. These drawbacks are obviated by the arrangement above described

Between the four working cylinders of the driving engine there are placed two double-acting reciprocating pumps, and beside these, a three-stage injection air pump, all three pumps being operated from the two connecting rods of the two front working cylinders, by the intermediary of balance beams and articulated rods,

the intermediaty or manuscular manuscular road, and fitted with safety valves

The injection air pumps serve as stand-by for the
unxiliary engine our pumps. Should the auxiliary engine, for some reason or other, be unfit for working, the injection air pump would be able with normal speed and moderate loads on the driving engine, to supply a sufficient amount of injection air.

The maillary oughe is likewise a two-cycle Die motor, its output being 250 effective horse-power. comprises two vertical cylinders of 305 millimeters bore compasses can extend symmetrs of some minimeters our and its millimeters stroke, and its supplied with fuel by a two-ploton fuel jump. The connecting rods of the two multiple-stage horizontal sir pumps are arranged to act on the two motor cranks set at 180

The driver's cable contains four hand-operated wing pumps, three of which serve to fill the cold water, and circulation condults, even in case of standstill of the two engines, whereas the fourth one communicate with the forced lubrication of the driving engine, thus allowing any gearing parts inclosed in the erank casing to be intricated in case of standstill of the locomotive. The conduits are led to both ends of the locomotive, thus allowing all cooling water compartments and conduits to be readily discharged

each end of the locomotive there is a driver's stand comprising the mechanism for reversing the main engine and the following arrangements: Levers for throwing the starting and fuel valves in and out of gear, a lever for controlling the amount of fuel rab by the fuel pumps, the starting head, the braking valve and sunder, the signal whistle and various gages.
The following operations are required in getting the

locomotive reads for starting, in stopping and in re-

Starting .- The starting-air valve at the starting head being slowly opened, atr is allowed to flow from the starting tanks to the starting valves of the engine; the ressure rises slowly and the engine begins rotat-The charge supplied from the starting valves is ed, while the pressure rises. When a speed of about 10 kilometers per hour has been reach the starting-air valves are thrown out of gear, and the

fuel vaives are set working. The toemsotive then is hi normal working order, the charge of the fuel pump and the pressure of the injection air being controlled in nce with the speed and output.

Stopping.—Throwing the fuel valves out of genr and actuating the brake valve.

Reversing .- By turning the hand-wheel round in the driver's stand, the valve gear is adjusted to backward running. A blocking arrangement prevents the engine from being reversed, while the fuel valves are thrown, but gear. In sarring, stooping and traveling, the same operations are performed, when going forward

same operations are performed, when going inswaria and backwarf, respectively.

After some preliminary trial runs on the Winterthur-Homainston line, the locomotive was taken under its own power to Burlin, partly hauling on its way a fast notive at a speed of 70 freight with its steam locor eters per hour; the traveling speed, in accordance with time-tables, varied between 20 and 180 kilometers.

### Commissioner Moore's Last Report

In his report of Angust 14th, 1913, to Congress for the year ended December 31st, 1912, Mr. Moore, the retiring Commissioner, shows the receipts of the office from all sources to have been \$2,118,158.30, and the expenditures \$2,022,000.11, leaving a surplus of 100 experiments \$2,002,000.11, rearing a surprise \$196,092.19 and the amount of the total net surplus ling carulings of the Patent Office, deposited in Treasury of the United States, to be \$7,160,017.95.

In proportion to population more patents were issued to citizens of Connecticut than to those of any other State—one to every 1,150. Next in order are the following; District of Columbia, one to every 1,229; California, one to every 1,434; New Jersey, one to every 1,50%; Massachusetta, one to every 1,50%; Illinois, one to every 1,639; Colorado, one to every 1,711; New York, one to every 1,786, while South Carolina is last in the list of States with one patent issued during the year to every 18,040.

The report includes some statistical tables covering a on of the business of the Patent Off 1837 to 1912; the first patent and the number of patents d in each year; the number of patents is the United States and foreign countries from the earli est period to December 31st, 1912, and an intecomparison between the receipts, expenditures and volof business done in the years ended December 31st, 1899, and Docember 31st, 1912, which shows the per-centage of increase is greatest in every item except the number of employees, indicating an increase in recelpts and in mass of work without a proportionate increase, but rather with a proportionate decrease in increase, but rather with a proportion the number of employees of the Office.

### Loss of the Zeppelin "L-1"

W HILE flying over the North Sea toward the Island of Heligoland, during the maneuvers of the German high sea fleet, the airship Zeppelin "I-1" was struck on September 9th by a violent gale and hurled into the water, carrying with it the twenty-two officers men, of whom only seven were saved.

This is by far the most disastrous calamity that has overtaken any country in the development of its dirigibles, and no less than construction reigns in German aeronautic circles Among those who lost their lives were Capt. Motzing, commander of the marine alreship division; Capt. Hanne, commander of the wrecked Zeppelin "L-1," and Baron von Maitzahn. It was also orted that the naval commission appointed to super se the trinis was on board The storm which struck the lii-fated airship came up

o suddenly that there was no time to make a landing. As the officers and crew were bravely maneuvering to As the oncers and crew were bravely manedvering to bring the big envelope into the wind a heavy gust sud-denly struck her amidships and hurled her into the sea, where, after an hour, she succumbed to the postuding of the waves and sank with fifteen of her officers and When the storm first struck the ship a wire was sent out to water craft lying in the vicinity of Heligoland. Torpedo boats were immediately hurried to the spot, but succeeded in rescuing only seven of the

The Zeppeliu "L-1" was a naval dirigible, the pride of the German navy, and was completed only last year, making her first ascent from Friedrichshafen on October 7th, 1912, and leaving there on a long reliability trial a week later. On this trip Count Zeppe offity from a week mer. On this easy counts appears was in common The ship carried twenty other offi-cers and members of the crew besides nearly three tons of fuel. She flew to Johannisthal in thirty-two hours and successfully established wireless telegraph com-munications with a number of German stations on the

The slilp had a displacement of 22 tons and a capac-The silp man is enjacement or 22 tons and a cepacity of 770,000° cubic feet of gas with 18 seeparate gas chambers. She was \$65 feet long and \$6 feet in than-cter and was equipped with three Maybick motive totaling more than 500 horse-power, due of these motors being pieced in the forward car and two in the same. The motors drove aluminium propellers, those in free in

having two liades each, and these in the semi-ticates each. The large statedly was displaced a of 60 miles per lour. For elevation the ship land signs horizontal and and for side secring, six vertical planes. The model differed from foreign satisfies in the gre-vits muck for carrying a supplies grain on a se ob-vits muck for carrying a supplies grain on second-tion plantorm above the ballious included with m the

melecracitis.

Although no less than a fairl dessin of the Respective melecracitis.

Although no less than a fairl dessin of the Respective melecracitis of price of the favoration of the less of the fairly was the first in which it less of life had occurred and, strange to relate, it resulted in the greatest loss of life is the history of selections. Before this diseases the greatest loss of life file of an airship and colored was also keep to great a less of the wrecking of Malvin Vantmanie dirigithie, the "Akton," seem Aliantic City, July 2nd, 1912. The "Akton," was demonstrated for the purpose of attempting a transacticated flight and was wrecked during one of the terion. A similar accident occurred, when the Freech sultituty dirigitis (Republique' explosed), on Repression 2005, 1000, at a halpit of 900 Seet, killing four French miltour.

Before the accident to the "L-1" the latest. Respective.

look, at a langer or 500 sect, mining tour Property moreover. Before the nocidisate to the "f-d" the latest Reppeths to meet destruction was the inhitary dirightle "L.E.-18," which was pounded to pieces by the wind after having weathered the storm for amieteen hours. A torief secount of this accident was given in the Senseristic American of April 5th last.

### Automatic Train Control

THE recent disaster on the New York, New Haven and Hartford Bailroad will doubtiess bring out the usual demands for the installation of automatic stop devices, rendering it impossible for the engineer of a train to run past a signal which has been set against him and into a block in which another train is standing. These demands will undoubtedly be met by the statement that no wholly satisfactory apparatus has yet been produced, and the usual controversy may be expected

expected. As it may, the situation serves only to empha-size the fact that the installation of electric fraction upon main-line railways provides a method of control ling train movements wholly apart from the operations of individual engineers, and renders it possible to com-bine the action of danger signals with the electrical machiner; in such a manner that the mere act of sei-ting a signal against a train will also cut off the supply of current, and render any further progress impossible until the opening of the block also restores the motive

Even if there were no other advantages found in the use of electric traction, it would seem us if this opportunity of controlling the movement of trains thr tunity or controlling the movement or trains through the control of the supply of motive energy should be worthy of consideration. The New Haven road is already partially equipped with electric traction, and it is possible that the cost of completing this work, and combining it with some such system of automatic signal control would bear favorable comparison with the cost of permitting the continuation of the existing state of affairs.

### The Current Supplement

IN this week's issue of the SCENTIFIC AMERICAN SUF-PLEMENT there appears the first instalment of Sir Oliver Lodge's remarkable address before the Bri Onver Longes remarkable accress between the strings Association—Charles Dury writes on Timecta That Carry Disease."—The Preparation of an Aviation Map of the World is discussed.—An articulated carrowgage locomotive built for service in Tamania is illustrated and described.—M. N. Buckman reports on Progress in Egyptian Exploration.—A very fine Elephant Group, the work of the Scuiptor-Naturalist Carl E. Akeley, appears on the front cover, and a short article tells our readers about Akeley's work.—H. N. De Andrade writes on Lenhard's researches on phosphorescence.— The Practical Operation of Gas Engines With Blast Furnace Gas as Fuel is the subject of an important paper by Charles C. Sampson.

Emigration from the British Intented more and more to be to other parts of the empire, justice thin to foreign countries. Thus there has been a notable failing-off in emigration to the United States. The last annual report of the Emigrants' Information Office, insued at a parliamentary paper, states that or 28,156 latters received only 1.4 per cour related to the United States. As compared with the previous year, Inquiries conversing the United States decreased £4.6 per court. In-coinsection with the enigration or shalled showers to Canada, an interesting society has lately been found-off with beodynature at Wilmains, though a the Inquiries of the Inquiries and the Inquiries of the Inquiries and the Inquiries of the Inquiries o

### Carrespondence

nd are not responsible for state index is the correspondence potents. Alterigrants con-capabilities contact be considered, but the names of cryptophilists will be withhold when so desired.]

### Boverning the Locomotive

Exercising the Lecunotive To the Editor of the Bourstone American I, joint with interest the discussion in your valuable imperion. the whose of revening a locomorbre to add in stopping when, the air brains fall to work.

It holds to me as though the writers have failed to show in vary theorogic knowledge of the working of a locomorbre-implement theorem, when the standard in the s

np apsed.

With all the learned dissertations which have been so laborisously prepared, they seem to be all the effusions of men who are like an estcensed gentleman of my of mean who are like an asteemed gentions of any acquaintance who was forman of a locomotive shop for a large railway lise on which there was a strike of engineers and be undertook to run an engine drawing a mali twin. He had difficulty in atopping at a vagic tank, and to make it nesses he usecupied from his tensis, and after gatting water backed up to get his trials, but lost ounted of his engine, and the result was cked train and several dead and injured mail clorks When he got home, and was asked how it happ red: "I can build an engine all right, but

Now for the old open secret, if such it may be called Now for time out open secret, it men to many to constitute if when the brakes fall to operate, the reverse leves is thrown clear over, with the throttle closed of course, the wheels will continue to revolve in the forward direction, but even then they excet some retarding force; then if a small amount of steam be admitted. force; then if a small amount of steam be admitted the retarding force will become greater, yet the wheels will continue to revolve in the forward direction, and so long as they continue to revolve in that direction, with the above conditions, two are holding back on the train. Of course, if enough steam is admitted to reverse the motion of the wheels, then practically no force is expected, but an engineer who known his business. force is exercic; but an engineer who knows his business and his engine can gage the steam so that he will get very nearly its ultimate tractive power to hold back on the train. Of course, sanding the track will help also, as it gives greater cohesion and enables him to use even more s cam without the wheels slipping or turning backward.

I dislike to take part in a discussion of this nature in any periodical, but when I see such mistaken ideas d as was done by your correspondents, and in a paper which I consider an authority on technical matters, I cannot refrain. I am gratified that the Editor in his remarks on this subject on July 5th did not coincide with the correspondents, but my explanation above more clearly explains the value of reversing when the brakes fail to work.

C. E. W.

### A Railroad Adopts the Automatic Stop.

To the Editor of the SCIENTIFIC AMERICAN;

To the Editor of the SCIENTIFIC ARBRICAN; Had the Jones subtrantic sol signal and train control system, as installed and operating on the Maryland & Pennsylvania Hallroad out of Baltimore, been installed on the New Havon road, the fearful rear-send collision caused by the fog preventing the engineer from seeing the signal, would not have occurred.

The Jones system is the electrical closed-chronic system, in the control of the signal would not have the signal when the signal would not have the signal would not have been supported by the signal would not be supported by the si

the signal, would not have occurred. The Jones system is a clostrical closed-circuit systems, operating signals and the application of the sir in the engine actorization, and an arranged that a train moves within a sone of protection, both front and rear, against poin switches, broken rain, received sign hand-on collisions. It has been tested through sizet and move and works more perfectly than the humans arind. The teste is divided into blocks, and as a train approaches a block which is occupated, or whire; there is an open switch, that unginose is signalled by a warning hell in size and it is not because being in the does not control the stein, and attempts to enter the block, or within a cortain distance of the charge being. In it brains are not not foundation. When the block is closer he gets a signal its process, it also provided the oughest tailing a consequent above a perfect state the control of the stein and the state of the internal before a substantial case. It is processed the agreement allows the engineer tailing a consequent above a perfect state the control of the state of the state of the latter of the state of the

d by the Interstate Commerce Commission and the Railway Signal Association, and can be installed in conjunction with the present signal

be installed in conjunction with the present signal systems as comparatively small cost.

The New Haven road offered a prise of \$10,000 for a system that would prevent rear-end collisions, to be tried on their road. If successful, however, they are to be allowed to use it over all their systems for nothing. The Joage Company would not onter into such a on-sided proposition, but submitted a counter-proposition, sees proposition, but summitted a counter-proposition, as follows: The Jones Company to equip a portion of the New Haven road with their system at their own expense, the New Haven road to operate it an agreed length of time under their own management. If satisfied the counter their own management. factory, the railroad company to pay a predetermined es; if not satisfactory, the installation to be removed

prior; if not satisfactory, the installation to be removed without any expense to the New Haven rolland. An identical preposition was made to the Maryland & Pennsylvania Ralibrad running out of Ralimore. After testing it for a period of eight months and having it passed on by some of the best signal engineers in the souther, they adopted the system, as per the following

Baltimore, July 9th, 1913.

Mr. Calvin W. Hendrick, President the Jones Safety Train Control System Co.

Baltimore, Md.
Dear Sir: We have r

own nir: We have recently increased our passenger train service between Baltimore and Belair, and after the first of September the freight train service will be increased also, and there will be a considerable movement on the tracks hetwood Date.

As your automatic cab signal and train stop has m all tests placed on same by us during eight months's operation under regular train service, we have decided to adopt the system on our road. You will therefore under the provisions of the contract we have with you regarding extensions, and extend your system on our road to Towson, Md., including the north switch of siding at Towson. In doing the work, please include red suggestions made by Mr. Scott in his examination of the system now in use,

### Yours truly, (Signed) W. B. BROOKS, Vice-President.

We are now the only automatic cab signal and train We are now the only automate can signal and train control system on a closed-circuit principle that is in daily operation and has a bona fide contract with a rail-road. The closed-circuit feature has been one of the most difficult requirements of the Interstate Com-merce Commission to meet. This feature gives prompt notice to the engineer should any part of the apparatus

Electricity has become a dependable factor, and the automatic electrical control of train movements is bound to come in the near future, as the present controi of the trains is costing too great a sum in lives and property. Such appalling accidents as have been happening in the past two years, together with the one that has just happened, are causing a profound impression in Washington that something is radically wrong, and automatic stops to check the engineer have

As the roads have been claiming that there is such automatic train stop in existence, I thought this an opportune time to let you know the above facts.

Calvin W. Hendrick, President.

Baltimore, Md.

(It is not the practice of the SCIENTIFIC AMERICAN to publish letters of this character; but we feel that the to purchan returns on the character; but we reset that the facts given above, showing that a railroad, after making a lengthy test, has found an automatic stop that is so satisfactory as to warrant its installation, under con-tract, are so timely and significant, that we publish this latter in full.—EDITON.

### Rewarding the Inventor

To the Editor of the SCIENTIFIC AMERICAN: It is generally conceded, I believe, that the inventor has done more to assure the mechanical supromacy of America than any other, although it is likewise popularly believed that he rarely gets the reward should be his.

should be his.

That he is a prolific species is shown by the eight hundred odd patents which are issued each weak by the United States Fatent Office. Not that there are eight hundred money-making inventions patented in America overy weak. The inventors sees mort in the baby of his brain whether practical or not. He has get to be an optimist, A possimist never would invent anything, because he would stark with the idea that the thing sould not be done anyhow.

The inventor in his enthissiana, and the newness of his idea can see it only in a favorable light. Cold facts do not distart him. Se, he goes hillstey alseed and is not at all surprised when he succoded, though everyone eight.

And this is as it should be; for gold facts ought not

unduly to discourage the inventor, nor should ridicule justify him in the abandonment of a revolutionary idea. That a thing has been done differently heretofore, is no reason why a new principle may not be a better The expert is more likely to be wrong than right when it comes to a new pher omenon.

This leads one naturally to the discovery of a neculiar condition, that is, that persons or firms who should do so, rarely buy really big inventions. They go plodding along selling the old device until one day they are shocked to find that the public has forgotten the old love and taken up the new. In the light of past experience, it would seem that they should look excefully into any new and startling invention, if for no

other reason than as a means of self-defense.

It is historical that the telephone was first offered to the telegraph people, who refused to see any merit in the "toy." It is also historical that the telegraph er bought up by the telephone company. disk talking machine was brought to the attention of a musical instrument company, who in rejecting it of a musical instrument company, who in rejecting it said that they were already marketing an instrument which had real merit as a means of enterta The musical instrument referred to has dropped out of , while the disk talking machine speaks for itself in millions of homes to-day.

But there are inventions and inventions; some are improvements of existing devices, meritorious because they enable one to do a thing easier, or in a more simple manner perhaps. Of this kind, the great bulk of inventions are made up. There are other inventions which are revolutionary, which upset the established method of doing things, or which attain a new object heretofore unattainable.

And just here may I cite as a curious fact, that the revolutionary kind, there have been born in the ten-mile square of the District of Columbia, more startling inventions than in any other equal territory in the world. To believe it one has but to think of ti telegraph, the telephone, the electric railway, ti electric light, both the talking machines, the motion picture machine as used to-day, both the type-casting picture machine as used to-day, both the type-casting machines, etc., the bistorical accuracy of which is so strikingly attested by the exhibits in the National Museum. To be sure, newspaper publicity has in some instances placed the invention elsewhore, but this does not disturb the facts in the case, but only points to the carelessness with which loose statements are sometimes accredited the weight of facts.

Pure invention and scientific investigation so blend into each other that the line of separation is not a marked one. The mind which conceives the one, is the mind which most easily attains in the other field. The mind which conceives the one, Both men are plodders, and take satisfaction more in the attainment of the end, the addition they contribute the attainment of the end, the addition they contribute to the sum total of human knowledge, than in the financial reward. And perhaps this is the real basis for the popular belief that the inventor rarely reaps adequate reward for what he contributes to the comforts and convenience of his fellow men

The inventor, the scientist, and the artist, are each popularly pictured as a personality obsessed by a single idea, and incidentally that single idea is not financial reward. He has a satisfying ideal, the pursuit of which, reward. He has a satisfying ideal, the pursuit of which, however, not only keeps him a poor man, but often works a hardelilip on those near and 'dear to him. And that is the real pity of it. The necessity, therefore, of turning saids to some more or less renumerative employment pushes his ideal more and more into the background, until finally districts and more more or considering the control of the control

This situation, namely, the necessity of carning daily read for himself and his, has wrecked more worthy inventions, with the attendant loss of the development funds, than any other single cause. If, however, the financial backers of the invention had the farsightedmeet to finance the inventor's family, more inventions would reach their fruition, especially revolutionary ones, the results of long-drawn-out study and experi-

I know that this statement will be seized upon by alleged inventors as a means to the end of living off their fellows. But in what very few instances this their relicions. But in what very low instances this may be so, perhaps it is only turning the tables, for, on the other hand, the inventor is notoriously the victim of the man who furnishes him money.

The real inventor, he of the scientific idea, is almost always a worthy man. He follows a high ideal and

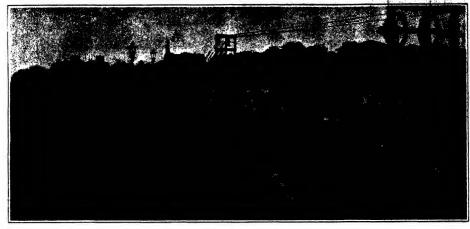
ot very well be wholly had. Being honest limiself slieves others honest, and becomes, therefore, the easy victim of the unprincipled promoter, and this is

So in conclusion, if this preschment should strengthen termination of some discouraged inventor, or aid in securing honest financial backing for his applicaadd in securing honest financial backing for his applica-tion, and the development of his great idea, it will be a further refutation of the belief that he is the legiti-mate prey of the heartless "moneyed man" and the equally unscruptulous lawyer. C. Francis Jenkins. Weshington, D. C.

### Sawing a Bridge With a Wire

An Old Idea Revived and Improved

By Jacques Boyer



How the old Pont Neuf was sawn apart.

siteration strengtonese the bridge by diminishing the load borne by the arches and plers.

Now the old bridge has been subjected to a remarksible engineering operation for the purpose of forming, in its solid mass and throughout its entire length, a conduit for elsectric cables connecting certain transway lines on one side of the Seine with a powerhouse recently erected on the other side. For this purpose it was necessary to gut a tracefu more than 4 feet with and nearly 7½ feet deep, leaving a thickness of only 20 inches over tite tops of the arches. In the shorter

arm of the bridge the work presented no difficulty, as the mass consisted of rubble, which yielded rendily to the pick and the pneumatic hammer In the longer arm, extending for a length of 550 feet from the statue of Henri IV. to the right bank of the Seine, a solid mass of asidar, cemented to-gether with concrete containing flint pebbles was encountered. As this mass could not be atneked with explosive or with wedges without endangering the stability of the bridge, the contractor decided to saw it longitudinally with a helicordial wire

Before entering into the details of the opernations required for the solution of this peculiar problem it should be observed that the idea of sawing stone with an endless wire and a pulverised abrasive p more than fifty years old. Various applications of this process are mentioned in a patent granted to Eugène Chevalier in 1854.

Chevaler claims "the employment, as a saving tool, of one or more metal wires, cords or chains, acting with a continuous or alternating rotary motion, and sufficiently flexible to attack all sides of the block of stone simultaneously." This interesting process, however, was forgotten until 1884, when it was revived by Paulin (say, with the aid of a Belgian contractor, M. Michel Thomar. Four years later, Thomar improved the process by introducing ball-bearing wheels, by which the cable can be guided in any direction, and boring tools of great diameter for the sinking of shafts for the purpose of separating the sawn blocks in the

The process still presented a serious practical inconvenience—the difficulty of repairing the wire or cable in case of rupture. Joints made by soldering or brasiles in the most careful manner frequently gave way. At last a workman conceived the idea of untwisting the state of the brasiles of the process o

ent lengthe and uniting them by a spitce four yards iong. This device proved successful, and the supporment of the selectionals wire become general in searble and granite quarries, as this method of separating the blucks combine rapidity with economy, avoids the employment of explosives, and, above all, dispenses with the long and everity operation of cutting trends through the rock. The recent operation on the Post Neuf, however, is the only instance known to the writer of the employment of the beliefolds wire for sawing a bridge.

The work on the Post Neuf was divided into three

The work on the Post Near was divided into three section, of which two were 164 feet long and the third was 223 feet long. Four parallel cuts, from 7½ to 8 feet deep, were made in such section by two sets of apparatus working simultaneously. The longitudinal profile of the work was carefully regulated in order to avoid cutting the extrados of the supporting arches.

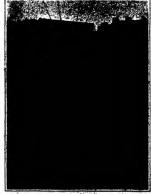
In front of the statue of Henri IV, was erected a wooden senfolding 10 feet high and 26 feet long, which supported a number of wheeled flat cars to which the sawing cables were attached. Each car carried an 18

> horse-power electric motor, a speed reducing shaft and the shaft of the wheel which moved the cable. Constant and uniform tension of the cable was assured by cast from weights suspended from an auxiliary cable attached to the car.

Retwent the sections wells were sunk to the depth of the cutting to be made. In each well were mounted two from poster which carried at their tops guide wheels for the sawing wires. From these wheels for the sawing wires witch descended into the well as the work progressed, and which could be raised by measure of hand-winches. The wire same of hand-winches wire well as the work well as the work was perfectly the same with th



One of the wells sunk in the bridge, showing the method of carrying the grit to the saw out by a



View of the work near the left hank of the ficine showing the condition of the trench for laying th



A STATE OF THE STA

The folding shouth in which the parachute is inclosed.



Pegoud demonstrating how the parachute opens clear of the machine.

### Recent Aviation Events Parachule Leap from an Aeroplane

HAT the parachute may become a fac tor as a life-saving device for aviators

Pegoud, who has startled his spectators a number of times by his feats of daring while in the air. Pegoud's experiment consisted of leaving from his manufactured. sisted of leaping from his monoplane descending slowly and safely to the ground by means of a specially construct mrachute, the invention of M. Bo

The experiment was considered ex-The experiment was considered ex-tremely hazardous, and it is stated that Pegoud had a long altercation with the police authorities before he was allowed to attempt the demonstration. The ac-companying reproduced photographs alpo-tic sethod of attacking the parachute to the seronispe. The parachute is contained in a folding sheath attached to the upper part of the fuselage, and the ropes are fixed around the aviator's body. In case of an accident or when the pilot is ready to abandon the machine, he presses a lever which causes the sheath containing the parachute to open, thus allowing the wind to catch the folds of the parachute. As the large umbrells-like structure up olds and inflates itself it rises and lifts the aviator away from the machine with it, thus leaving the plane to its fate, while the fillot descends unfelv.

On the day of the experiment Pegoud ed in a strong wind to a height of

about 900 feet and pressed the lever which released the para-clute. The machine began to descend swiftly and the specta-tors were filled with apprehension; but almost immediately the outline of the parachute revealed itself and the aviator was lifted clear of the machine, dropping slowly and safely to the ground. The aeropiane, left without a pilot, was, of course, completely wrecked when it struck the earth.

course, completely wrecked when it atruck the earth. Pegoud is the aviator who is reported as having recently accomplished the daring feat of flying an aeroplane upside down and again righting the machine and descending safely without damage to the aeroplane or to himself. The machine which Pagound uses in all of his flights is a Bierlot monoplane, fitted with a 50 hone-power Gaoms motor.

A New French Water Glider.
A hydroplane of novel construction has rece maneuvering on the Seine near Paris, driven by M. Teilier, who designed and built the machine. Teilier is a French zero-plane enthusiast who has been engrossed for some time in the study of air-propelled water machines, and has perfected the glider which is illustrated

berewith. This muchine has a typical aeroplane fuselage mounted on three boat-like sows, and is steered by means of a hand-wheel connected with the rudder. In front of connected with the rudger. In front or the driver's seat is an extra seat for a passenger. The hydropiane is driven by a four-cylinder, 50 horse-power Daigner automobile motor, which is connected automobile motor, which is connected with the propoler shaft by a climit. The motor is of the water-cooled type, and is supplied with cooling water. Jon. Sive long vertical radiators placed above the motor at the extreme sud of the France. The first lumb is attached to the france at the react of the motor. The propolities is a Lavayaneour of the helical stands. type

An important feature of this marking in the very small amount of draft; when its crotics the done, draw size that it condinates of water, which condinates is the high most attituable. It is continue



Wrecked monoplane, which fell to earth after Pegond's parachute leap



wings faces.

of 70 kilometers, or about 435 miles per New Dunne Aeroplane May Solve Sta-bility Problem.

Much interest has been aroused to the world of avlation over the recent series of successful flights of Lieut. J. W. Dunne and Jules Fellx in the new Dunne aero-plane, which seems to prove the contention that stability in air muchlus has at last been realized. The principles upon which the Dunne machine is constructed are simplicity, stability and safety, and if the designer's predictions are realized it is probable that within three or four years the art of flying will be well on the road to perfection, and that with the adoption of the stable aeropiane, flying

will be as safe as automobiling
Although the principle of the Dunne
machine is not entirely new, the V type of wing having been used in gliders as early as 1906, its application to the power plane is an improvement it was chiefly through his experiments with models that the inventor was lead to design his pres ent machine. The principal feature which first attracts the attention is the V shape of the wings with the point at the forward end of the machine. Since the two wings or planes are complete in themselves, being provided with warping extremities, the front elevator and the tall are eliminated. The V-shaped wing is applicable either to

the monoplane or the biplane.

Another feature that is emphasized is the manner in which the front edges of

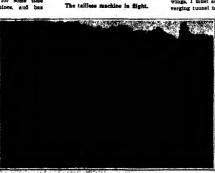
the manner in which the front edges or the wings are turned down so that the plane sections present nearly a cylindrical curve. In a communication to the Aero-nautical Society of Great Britain, read at one of the society's meetings, Lieut. Dunne described his machine, referring par-

meetings, lifett. Dunne described his machine, referring par-ticularly to the construction of the wings, as follows "I give the wings a much more definite arrow form than that of the Zanonia (leaf) type; the tips are rolled down in front instead of rolled up behind, so that we have a concave under surface instead of a concave supper surface in this region; while the outstanding feature of the type is the fact that the whole wing forms the roof-part of a tunnel running backward and outward across the wing, the crown of the tunnel being sloped back at a greater angle than are the wings themselves, and the sides of the tunnel preferably converging toward the rear end. The improvement in efficiency gained this method of construction is very extraordinary; but as wish to confine myself to the safety devices embodied in the wings, I must ask you to take my word for it that this converging tunnel tends to produce a positive pressure under the

negative wing-tip, so that for the same of negative pressure on we are able to use a greater negative unale than in the Zanouin type. And it is the geometrical difference between the angle at the tip and the angle at the front of the machine which counts for me

"My attention having been accidentally directed to fluid flow in diverging, converging, and vena-contracta pipes, it occurred to me that wings bulli in such forms would give pressure distributions quite different from the ordinary, and also quite different travels of the center of pressure, and were therefore worthy of investigation But the stability actually obtained with the first model came as an astounding surprise.

stant-angle-of-incidence-machine such as this is, ipso facto, a constant speed machine. For if the speed is accidentally reduced, the machine begins to sink: this ses the angle of incidence; the re-(Concluded on same 222)



The Dellier hydroplane on the Seine.

NOW SHOW IN THE PROPERTY OF THE PARTY OF THE

#### How Deadly is Railway Travel?

S TATISTICS have an irritating way of disappointing popular beliefs. That the mortality of railway travel in the United States is too high cannot be open to discussion It will be too high so long as it remains nlove zero list the statistics of the subject disprove such common notions as that it is rising, that it is not failing or that it compares terribly with the average

infinity of railway travel elsewhere in the world.

If you take the number of passengers carried and divide it by the number of killed during a year, in this country and in Europe, you will get a comparwhich is very duraging to the American ratiroud. It will show that in this country one passenger in every four million carried is killed, against one in ten or

twelve million in Europe. But that is not a fair comparison. The average distance such passenger is carried is approximately three times greater in this country than in Europe. It is plain that the risk of travel is in proportion to the distance send miles is a thousand times greater than the risk of traveling one mile. Therefore, the only fulr basis of comparison is that of "passenger miles." The "passenger mile' is a term used to express a unit of passenger transportation. it is one passenger carried one mile. For illustration, the number of passengers car ried by American railroads in 1912 was roughly one billion; but the "passenger miles" were thirty-three billions, because the average distance traveled by each pas-

senger was thirty-three miles. One pas-senger traveling thirty-three billion miles or thirty three billion passengers traveling one mile each would make the same number of "passenger miles" as one billion passengers traveling an average of thirty-three

On the Fair Basis.
On the basis of "passenger miles," a comparison of the mortality of travel in the United States and in Europe is much more favorable to the American rail-Il shows that the number of passengers killed per billion of "passenger miles" was 71/2 in Europe and 8 in the United States, during the years of the latest completed statistics, as follows:

Europe, 1910 . U. S., 1912 .	Passenger miles, 73,555,578,571 33,510,073,000	Passengera killed. 554 270	per, billion pas, miles 7.53 8.06	
U. B., 1912	33,510,673,000	270	8.06	

These statistics refer only to passengers. The mortal ity among employees is another matter, in which dif-ference of temperament between the foreign and American employee is an important factor. Also, as is evident, they refer exclusively to deaths of passengers, and statistics of injuries are purposely omitted, for the reason that they are imperfect. Deaths are a definite quantity and the statistics are continuous, so that comparisons are accurate. That is not true of injuries, which night seem to increase for no other reason than that they are more systematically reported as efforts are made to decrease the risks of travel and railroad employment Actually the ratio of injuries to deaths should be fairly constant

### The Improvement Here.

More important than that the rate of mortality in

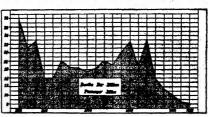
More Important than that the rate of mortality in American railiawy fravel compares less unfavorably with that in Europe than is generally believed is the fact that if is remarkably failling in this country. The "passenaer muleo" (the number of possenaers carried one into reported by all the railways in 102 were 25.010.075.066, and the number of passenaers killed, as reported by the Interstate Commerce Commission. WHE According to the Bureau of Railway News and Statistics, 48 of the killed classed as passengers were in fact em-ployees, so that the net number of passengers killed in 1912 was 270. That is roughly eight passengers to each billion of "passenger miles." In 1892 the numor passenger miles in 1892 the number of passengers killed per billion of "passenger miles" was 28. The fluctuations in the number from 1892 to 1912. inclusive, and the remarkable tendency to doctine, are shown in the chart. The figdecilne, are shown in the chart ares are shown in the table below

To show that rallway travel is not so deadly us it is thought to be is not to say that it is not much more deadly than it ought to be; but certainly the railroads are cutified to the statistical proof of what they have stready done to lower the

That hy the fairest possible statistical comparison the rate of mortality yet is

higher in this country than in Europe lutely prove that the railroads are less by prove that the raincade are less that to protect the lives of possession differences in equipment it is been opean travelers to take the version prican travelers take. Before 2 the differen every passenger is tucked aw scarce every passenger is tucked away in suc ease ment. There is no such thing as a pantly one we to overtake his train. It might be exqued, too the risk of travel increases faster than the fits but that, of course, is an abstraction.—New York

Kaiser Wilhelm Canal Locks the Large



The falling rate of mortality in railway travel.

Wilhelm ship canal has included a reconstruction of the locks on dimensions which entitle them to be called the largest in the world. They are 147.5 feet wide. 1,082.7 feet long and 45 teet deep. The new locks of the Sault Ste. Marie Canal will be considerably longer, 1,200 feet in length over all, but they will be 80 feel in width only as against the 147.6. The Panama Canal locks are 110 feet wide by 1,000 feet in length, with a depth of water of 40 feet.

Year	I'annenger milos	Passengera killed.	per billion pes, miles.
1892	18,862,898,299	. 576 A	28,60
1893	14,229,101,084	299	21.08
1994	14,289,445,893	824	22.66
1895	12,188,448,271	170	13.99
1896	13,040,007,233	183	18.92
1897	12,256,939,647	222	18.05
1898	18,379,930,004	221	16.50
1899	14,501,327,613	290	16.37
1900	16,088,076,200	249	15.50
1901	17,353,598,444	262	10.21
1902	19,6%0,937,620	845	18.02
1903	20,915,763,881	355	17.00
1004	21,923,213,536	441	20,13
1905	23,800,149,436	637	22.56
1906	25,167,240,881	418	16.65
1907	27,718,554,080	647	28.35
1908	20,062,836,044	496	18.95
1909	29,452,000,000	835	11.85
1910	32,338,496,329	324	10.03
1911	38,201,694,609	281	8.46
1912	33,510,673,000	270	8,08



Engine "Pulling Billy," Wylnes Suffway, 1818. 

ats with a frame mor smooth wheels driven by manu working cranks connected with wheels. The object of this experit wheels. The object of this experimental carriage was to ascortain if a loopmostive engine, having smooth wheels running on smooth rada, could pull anything of a load; for up to that time all loopseiture had toothed wheels running on rack ratin. It is tree that Trevifishel's engines had smooth wheels, but they falled for other

mooth wheals, but they falled for other reasons. The result of lises trials, which were carried on under the supervision of William Hedler, Hackett's "cool riesses," when were so encouraging that early in the year 1813 the frame and wheels were fitted with a cast iron hother and a single steam cylinder d inches in diameter, which drove the wheels through intermediate gearing. After repeated trials with this experimental engine the construction of a new size was decided upon, chiefly because of the defective steaming capacity of the bother. No time was lost, and in the same year Blackett ordered Hedley to rebuild the engine with a new boiler and cylinders. This was done with the senistance of Timothy Hedkowth, who was foreman senific at Wylam othy Hackworth, who was foreman smith at Wylam and a clever mechanic. In fact, at that period blackand a dever mecanic. In net, at that person outco-senths were the only mechanics who worked in iron and practically all the early locomotives were made by them. Hackworth was Stephenson's great rival, and there is no doubt that the "futher or railways" spent his Spandays at Wylam making notes and statches of "roung Billy" and other engines there which were built and partly invented by Hackworth. For this reason Hackworth deserves a more prominent place in motive history than has remerally been assigned to

fling Billy" was finished in May, 1818, and put to work bauling coal wagous on the five miles of track connecting Wylam Colliery with the wharves on the The engine appears to have been successful from art, and it attracted much attention, mingled with opposition from those who were interested in horse It has two vertical steam-jacketed cylinders has dismeter by 36 inches stroke, which by grass b mones casemeter of so incress stroke, which by grass-hopper beams transmit the power downward by con-necting rods to a shaft with cranks set at right angles. This shaft is journaled in the frames, which are of wood, and carries a spur wheel, which, by four other spur wheels, transmits the power to the four driving wheels, each 30 inches in diameter. Steam was die wheels, each 39 inches in diameter. Steam was dis-tributed by short D slide valves worked by a tappet motion. The working steam pressure was 60 pounds per square inch. The boiler is of wrought iron lagged with wood, It has a return — that the furnace is at the same

nue, so that the furnace is at the same and as the chimner, where the fireman attended to his duties, standing in the confer. The engine driver was stationed at the other and of the boiler, where he had the lovers and working parts within early reach. The tender consists of a wooden frame supported on four wheels and carrying a square water tank and coal box. The combined weight of the engine and tender is about tan tons, and engine and tender is about the tone, and its usual performance was to haul fifty long tone at the miles per Bour. The exhaust steam from the crystolers was discharged directly into the chimmer, and the noise these caused arounded so misches control around a misches control around a more control of the modern that legal options was taken opposition that legal options was taken on the subject, but the missuance was subject, but the missuance was subject to the control of the control

continued to the contin

an and a state of

#### House Moved in Sections

A N enterprising knows mover in West, The tensary line, Mass, inding it practically impossible to move a three-story dwelling as it stood, silood it straight down through the ridge of the gable, and curted it away in two section. Buch section was about forty feet high. The base, however, was thrity feet in length by twenty in width. The result, of course, was that every moment it threatment be topple over. To obviste this, the brick from the chinneys and the stone from the foundations were leaded upon the first floor for belief.

While the work of alteing was going on, bixons, of course, were required to hold the parts Smuly in position. When the two parts were reseaseabled ten miles away from their original site, the workmen put them together so well that, with a new coat of paint over the whole, no one would over have suspected the remarkable feat that had been achieved.

The house at its old location stood ten feet above the street level. This was the reason that the peculiar method of transporting it had to be resorted to.

### The Eiffel Time Signals

O NE reason why wireless telegraphy seems uncamp is that we have no visible demonstration of the electrical surgings up and down the antenne which generate electro-angentic waves. However, were our eyes constructed to detect the short-wave light beyond the violet portion of the spectrum, we world see the series of a high-powered action acrow with a blush imaliaceocco. This giow, which is invisible to our eyes, is visible to the eye of the samera. The secondparity photograph, taken from the second platform of the Effici Tower and looking up toward the top, showe the ultra-tolet giow abound the antenna. The photograph was taken when the Effici Tower station was taken when the Right Tower station was taken ones to Bellin, and our own Arlington station, and they have proved of great whine to navigators, for hy these they was correct their chramometers and determine their position at we with great accounter.

Motor Cantr Built by a School May A in retomobile invalidir chair, bright by A in 16-yan-old high echols by the sidcurded dishpara, brane feeders, appearsized midi-matter disher with out the citized midi-matter at the attention, of the last been attracting the attention, of the control of the control of the concine; has been attracting the attention, of

The ministence on you healt by Charlies frequency in an amendous machine shap invited in Stampether's littles. A because form Statistic that; a measure because your and heavening just from the artist, and the measure from which is sufficient to the comment of the property of the property of the state of the state.



Primitive Japanese pile-driver.



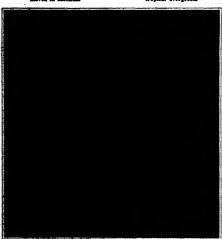
Three-stery house sliced in two and . moved in sections.



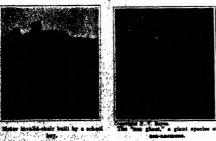
A hand-driven pile foundation.



Cabbage paim self-grafted into a tropical evergreen.



Announcing the time from the Eiffel Tower. Note the luminescence along the angence.



framework of the hand-driven chair. heavier axie was turned upon his lathe. The rear wheels of the hand-driven chair were too light to carry the heavy machinery of the proposed new chulr, while the els of the smashed motor cycle were too large to fit into the frame of the old clustr. This difficulty held up the work for several days. At last the boy rebuilt the motor cycle wheels, cutting them from 30 to 28 inches. Pneumatic motor cycle tires, the only new things about the whole chair, were then purchased. A gasoline tank was made from a discarded dishpan, and lucased in a box made from the cherry paneling of the headboard of an old bed. Stop cocks from an old gas stove were used to regulate the flow of gasoline. A belt drive being found lande-quate, the boy substituted a chain drive. A band brake on the left side of the mo chair, made from the Iron hoop of an old washtub, works on a drnm cut from sting The same lever that throws a casing the same lever that throws out the clutch applies the brake. The tire of the front wheel is wrapped with a brass window chain to prevent skidding. the rear wheels being equipped with unti-skid tires. A dog chain was at first used on the front wheel but it was musatis-factory. The lever controlling the supply of gas feeding into the carbureter is made from an old file. The cut-off valve is made from a one half inch gas pipe "T," a brass curtain rod and a clock spring. The steering lever is made from a length of gas pipe and the end of a mop handle. The 2% horse-power motor is alr-cooled, the fan being made from an old brass fender, and the blower-case from a the can which at one time held a gallon of apple butter. The blower-case is covof apple butter ered with asbestos to deaden the sound. The boy constructed the entire oiling sys-tem from brass tubing and a little solder A thry bleycle hump to comply with the city ordinance completes the outfit

### Grafting Performed by Nature

IT is common to see a tree or plant grafted by man into another tree or plant of the same class, but of a different But an instance of a tree of one class having been successfully grafted by man into a tree of a wholly different class is certainly most extraordinars. How more of a curlosity, then, would be the sight of a tree of one class grafted by Nature into a tree of another class. And yet such a feat has been accomplished, as witnessed by the accompanying photograph, which shows a cabbage palm—an endogenous tree—solf grafted into an ex-ogenous tree (a tropical evergreen). This photograph was taken in January of this year The tree may be seen about a mlic out of Santa F6, Isle of Pines, West Indies, on the Government road or calzada leading from Santa Fé to Jucaro. 1 11 stands in the front lawn of Mr. L. E. By-crs, an American resident of this isle, which is said to be the "Trensure Island" of R. L. Stevenson. The lower portion of the paim is dead, and can be seen in the photograph close to the young lady. The The upper portion, however, is in perfect condition, and is as smoothly coalesced the body of the exogenous tree as are the latter's own branches, and receives its nourishment from its foster parent. Nature did this wonderful piece of grafting by the method called "hearching," and it probably precedes artificial hearching.

### Remarkable Giant Sea-anemone

THE deep-water reefs off the Islands of southern California, particularly Los Angeles County, are very profile in strange creatures, which are brought up occasionally by fishermen.

the of these odd creatures is shown in the accompanying illustration. It is the glaut of the secamemones, in a land where these animals are glauts in every sense of the word. The amenone is a cound of the coral. The amenone is a cound of the coral polyp; is, in point of fact, a polyp similar to the coral except that it is without the faculty of secretur, line

The anemone here shown is a dweller in water from eight hundred feet to one (Concluded on page 224.)

#### RECENTLY PATENTED INVENTIONS

These columns are open to all patentees. The notices are inserted by special arrangement with the inventors Terms on application to the Advertising Department of the SCHEMPIPIC AMERICAN

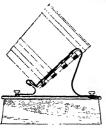
#### Of Coneral Interest.

Of General Entervet.

(HEENHOUSE GLASHIO,—F. VAN ARSCHE,
Fulton and Ros-Aves, Jersey City, N. J. The
invention provides a roof formed by panea of
glass which is amoothed between the sash bars
receiving the glass, and in which the panes of
glass can be replaced without disturbance to



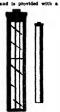
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SHOCK ABSORBING ATTACHMENT FOR SCALES

which will absorb most of the shock when a tub of butter is thrown hastly thereon, thus relieving the scales of jar and making it pos-sible to ascertain the weight of a tub of hut-tor more quickly.

FOR THE STATE OF T



ing casing wherely the bottle proper is better protected not only from the light, but from blows or present which would tend to crush blows or present which would tend to crush of the control of the co

and the vibrating mechanism RRING RETAINER AND SEAL.—J. Popper, 1814 Avenue N. Brooklyn, N. Y. In order to prevent accidental or unsuthorized remeast of bungs, Mr. Popper has provided a device consisting of a strip which is placed over the bungs and secured to the barrel with seeis at each end so that if the retaining strip is removed the seals will be blockes, betraying the

YENTILATING REGISTER—F. A. WILSON, 25d Steuben Street, Brooklyn, N. Y. Among the principal objects of the present invention are the following of To provide a register for regulating purposes with a plurality of louvers, and means for adjusting and holding the louvers in adjusted position; to growide in the louvers in adjusted position; to growide

means to limit the full opening of the lowrest; and to simplify and economies the construction. ENVELOP FOR RAMPLES—J. PLAISM. 130 Rue du Paubourg Ht. Denis, Parts, France The lavention relates to wrappese in the form of an envelop and the clearer of which is obtained by means of a tongue width is secured to the lower part of the envelop, and which is the work of the part of the control of the

HUMIDIFIER.—G. A. Mayms, New Dorp, New York. The invention provides a water receptacle which may be attached directly to a radiator. The water in the receptacle being



HUMIDIPIER ATTACHED TO A BADIATOR.

evaporated by the heat of the radiator, will increase the bumidity of the atmosphere in the rooms, and thus bring the air to a proper condition for breathing.

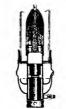
#### Hardware and Tools.

Hardware and Tools.

HORF-CLAMP—P. R. Encizeon, Port Chester, New York. An improvement on an investion, previously patented by Mr. Eriekson, is here provided. The clamp consists of a band of tough, facilitie metal, the sade of which over jap and one of which we clamping acrees dapted to bear against a book formed on the opposite end.

#### Heating and Lighting.

Blenking and Lighting.
BURNER—B. Lozzeras, Santo Domiseo.
Dominican Republic The invantion relates particularly to burners adapted to consume alochol vapor, and is arranged to facilitate the formatica and distribution of the vapor. The uncert is lighted by igniting alcohol contained in a small annular pan. Centrally disposed within the martie is a rod which is heated by



BUSHES FOR ALCOHOL VAFOR LAMF. The burser, and which serves to vaporise the alcohol coming from the main source of supply when that in the pan has been exhausted. JACKET FOR TANKES—N. J. KELLA, 50-sey City, N. J. This luveniton provides a temporary cover of lacket for the server of the server of

### Household Utilitie

Household Utilizies.

COENNG UTENSIL—A. E. TRENTOWSKY,

Mt. Johns, New Brinnwick, Canada. In order
to get rid of kitchen odors, particularly those
of frying, stawing, etc., Mr. Trentowsky has
invented a pan in which the odors will escape



through the bottom of the pan to the inherior of the stove and themes to the chimney, pro-vided of course that the pan is set over an opening in the stove top from which the lid has been removed.

COORTING DEVICES. G. E. Cappings.

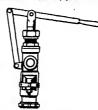
Releithan, District of Alasin. In order to proving for seeking or handing restions significa-or food in the case in which they are pended, Mr. Chaghrean hes lavareded a device-counted-ing of a sunser of saint facilities to which the saint of the country of the country of the with binarios beating to each speng label. CAN OPENIER—A. Monker, 488 A. Papel St., Danver, Colo. The principal objects of the present investion are to provide a can openic with an improved puncturing pinkl, and an improved factors wherever the hability or

一个经验。1950年李原明和1800亿9公司



IMPROVED CAR OPERER AND BOTTLE-TOP

BLOW-OFF COCK.—F. H. SMITH, 2505 Gabriel Ava., Parsons, Kanesa. The object of the present invention is to provide a construc-tion which will effectually perform the func-



tions usually incident to blow-off cocks with-out the necessity of ground joints and other parts which ordinarily require frequent and careful machinery.

Ballways and Their Accessories. L. RAIII JOINT JOCK.—W. Kive and P. L. RAVER. West Berbeley, Cal. This invention votation to rail locks on spile plates of rail juints, and has reference more particularly to the class comprising a key, and a wedge coacting with said key and projecting through the spike plates and the wab of the rail, and thereby wedging the spike spaces and the rail of the received wedging the spike space against has

Pertaining to Vohicles.

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Orlando, Fin. This shock absorber is singled
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bodies and their axies, whereby a robest vibertory, morable parts, particularly validle
bodies and their axies, whereby a robest vibertory, morable parts is prevented.

VMRICLES WHERLE.—J. L. WOOR, \$18 ReatVMRICLES WHERLE.—J. WOOR, \$18 Reattive as infantable who seer the lath. The
wheel are prevented to the control of the
wheel are prevented to the control
perturbery of the bestel is a rim supported on
spokes carried by a ring that bears against the
lastated tube.

Norm.—Copies of any of these patents will be furnished by the Screwitzia American for tan conts each. Pieces state the same of the patentse, title of the invention, and date of this paper.

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### Recent Aviation Events

conscised from page 188 ) sultant between the lift and the negative presents, consequently goes back, which makes the machine dive slightly and thus recover its proper speed. While, if the speed is sceldentally increased, the machine sizes this reduces the argie of in cidence the resultant consequently goes forward which makes the machine ele-

wate and slow down to its proper speed While Lieut. Dunne was carrying on his experiments in England the British War Office could not be induced to take up the promotion of the machine on account of the skepticism which at that time ex isted regarding the future of the heavier than air machine Accordingly Lord Tai libardine, chairman of the Blair Atholl Aeroplane Syndicate of London which was promoting the Dunne machine was forced to negotiate with a French firm for its manufacture hence most of the tests have been made in France

forced to negotiate with a French firm for its manufacture hence most of the tests have been made in France. The most recent demonstrated on the new aeropiane a test which seemed to confirm every contention of the inventor came only recently when Jules Fellx the noted French aviator piloted the Dunne biplane from Eastchurch across the English channel to the French coast during a storm. Upon landing Felix declared that the machine maintained its stability in the high wind to a remarkable degree and predicted that this type of machine will eventually become an important factor in practical seconsulties.

#### The Centenary of a Famous Locomotive

(Concluded from page 280.)

Billy was thus too heavy for the track and it was necessary to carry haif a dozen spare fram-plates on the engine treplace those which might break during the journey Theoretore in 1815 Hedley dacided to rebuild the engine as an eight wheeler and placed each group of sour wheels in a truck frame thus distributing the weight and enabling the engine to round curves with greator case.

About 1890 the Wylam road was relaid with cast from edge ratis of the double-flanged fish belified type with half lap joints supported in chairs spiked to cross sleepers. The gage was 5 feet each rail was four feet long and weighed 30 pounds per yard. The eighte was then rebuilt with four wheels and practically restored to its original form the undier belux removed. It thus worked continuously for about fffy yarr and it was the first size cessful locomotive in the world.

A glance at the illustration will show

A glance at the Hlustration will show that Puffing Billi) beam little rosem blance to the modern locomotive. The explanation is that the locomotive endine is an offshoot of the restionary sugine for the creations of Newcomes and Watt long anti-dated the designs of Trevithick, Blenkinsopp, Hedler and Netphenson on that the early locomotives were but little better than stationary engines on wheels—upright cylinders working beams and other pearing being main features in the designs. It was not until 1520 that George Stephenson after building several unsuccessful locomotives of the Puffing Billy class produced his famous flocket, which comprised all the elements of the modern locomotive.

In 1865 Puffing Billy" was placed in the Victoria and Albert Museum London where it can now be seen resting upon some of the original fish-beliled rails al ready described.

To get an idea of the enormous increase in sins and weight of locomotives since the days when Fuffing Billy was at work, we will take the mammoth freight engine in use on the Actheson Topels and Santas Fé Railway which is the largest in existence. This iscomotive was described in the Sciamrizzo Ammican of June 17th 1011 for which reason duly a few dimensions need he repeated here for the purpose of comparison. The sende weight 2005 tens, the tender 117 tons, making the tend weight 165 tons, it is indeed over all to 126 tent for increase and the sender weight over all to 126 tent for increase.



### The Merger of East and West

But there is neither East nor West Border nor Breed nor Birth
When two strong men stand face to face tho they come from the ends of the earth!

In the "Ballad of East and West," Kipling tells the story of an Indian border bandit pursued to his hiding place in the hills by an English colonel's son

These men were of different races and represented widely different ideas of life But, as they came face to face, each found in the other elements of character which made them friends

In this country, before the days of the telephone, infrequent and indirect communication tended to keep the people of the various sections separated and apart The telephone, by making communication quick and direct, has been a great cement ing force It has broken down the barriers of distance It has made us a homogeneous people

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### The Chronology of Aviation

THE Scientific American has received from Mr. Hudson Maxim and Mr. William J. Hammer, a limited number of the reprints which they have just saused of the very complete "Chronology of Aviation, originally prepared by these gentlemen for the World Almanac of 1911. The data embrace the essential facts relating to serial progress in addition to a short historical riferum, one finds herein tables giving altitude records, speed records, quick starting and slow-speed records, passenger carrying. English Channel and other over-water flights, cross-country flights, notable distance and duration flights, etc. There are also statistics relating to accidents and data relative to pherical and drigible balloon or airwhos, etc. Of no small interest are the tables giving the most important flights of the Wright brothers. There are doubtless many readers of the Scientific American who are much interested in this subject and how would be glot to secure a copy of this interested in this subject and how would be glot to secure a copy of this interested in the subject and how would be glot to secure a copy of this interested in the purchase. SCIENTIFIC AMERICAN, 361 BROADWAY, NEW YORK

What is the Aurora **Borealis** 

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Werren H. Miller, the Naturalist, price into the mystery of the NORTH. ERN LIGHTS' general Arctic displays in POPILAR ELECTRICITY and the WORLD'S ADVANCE for Cetober. Verill anjay his article and wonder at bees little yea he are of this facinating phenomenon. A brish wish South to the Blug Ridge Meantains and



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is presented, in the remarks story of an immense that revealised and made over by a monater modern per-devalupment. Another little jump of 9000 miles to exam-

The Ancient Tanks of Aden these wold-old Pensan reservoir at the Red Sea fortus, defrage time where it near seins, it helter than Hades, and mighty unhealthy for a white men. The

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diameter; the low-pressure evanders, as diameter; the low-pressure dyameter, as inches in diameter; the common strains is 32 inches. The maximum draw har pail is 111,000 pounds, and this locomotive has having 1,911 tons at 12 miles per hour

### Remarkable Glant Second

(Concluded free, page 137.)

fifth of a mile in depth; where a gleam of light never penetrates, where the temperature wanders down to the ers down to the vicinity of freezing, and where the pressure is as great that all asimals living there must great that all animals living there must be more or less adapted to such as a exist-ence; their systems being perusested with water to offset the pressure. When brought up it was inconspicuous. It at-tached itself to a bail, and when taken tached itself to a balt, and when taket off, uninjured, recembled a ball of white tiesh about the size of a small apple.
When placed in a tank in the aquartum it When placed in a tank in the squartum is remained inconspicuous for days. But on-night the watchman in going his rounds, saw a splendid column of white over on-foot in height and expanding as much more across the tentacles, looking, said, like a miniature volcano; its fit tentacles being pure white and resembling tentaces being pure wine and resembning clouds against a durk sky. In the day-time the anemone reduced itself, by ex-cluding water, to an unnoticeable bulk; at night gradually increasing in size by pumping in water, taking the shape of a graceful perfectly symmetrical pillar. Then the pure white tentacles would begiu to appear and elevate thes performance which I observed through the courtesy of the old soldier who is a night watchman at the little aquarium at night watchman at the little aquarium at Avalon. Gradually the anemone would rise in a miraculous manner, like the mysterious plants of Persia under the hands of a fakir, until it stood firm and rigid, a spiendid creature a foot or more in height and six or eight luches acro the tentacies, which were pure white, sug-gesting the name "sea-ghost," given it by one of the men.

derful anemous, which might be called a sea-carnation, or used as a model by an architect when it reduced its size. This mplished by a sudden restriction midway, or a little above it, in the column which, apparently, forced a large amount of water from the column. The support thus removed from the enormou on or tentacles, the latter fell over until they almost touched the bottom, and the anemone had the appearance of having been stricken, or struck down by a heavy blow. In a few moments the restriction increased and the pure-white fluted tentucles began to disappear, drawn into the body mass which now impercep ibly settled down upon itself, giving the observer the impression of being witness to a miracle, as the giant grew smaller and smaller until in a short time nothing and statier until in a short time notating could be seen of the splenders of a few moments before but an inconspicuous mound of flesh, but a few inches high, perched upon a water-worn pebble four inches long, clinging to it by the seekling disk possessed by most anemones.

### Fighting the Plague With Scap and Petroleum

THE authorities of the Dutch East Indies are continually fighting the danger of the plague, which threatens the communities especially in the harbor towns, where rate from the incoming ves-

els spread the disease germs.

1 Dr. Pill, Government physician for the Dr. Pill, Government physician for the hncbor of Socrabia, has now found that a mixture of petroleum and soan, applied freely to the localities where the ratis warm, will effectively destroy their fisan and with them the plaque beddil. This new distinctant is obsepte and more effi-cacious than carboic acid.



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inding the Worth-while in Europe. By Albert B. Osborne. New York: McBride, Nast & Co., 1913. 12mo.; 240 pp.; illustrated. Price, \$1.40 net. 340 pp.; illustrated. Price, 81.40 not. In aption of the width of tencitory necessarily covered to the width of tencitory necessarily covered to the second of the second

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Jeans Chairtus und sann Stram. Eine Chronologische Unterstuding von Arathur Stentzel. Hamburg: Verlag der Astronomischen Rorrespondens, 1913.

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THE RESIDENCES OF THE AIR AND AVIA-TION. Experiments Conducted at the Effel. Second edition revised and en-larged. Translated by Jerome C. Hun-saker, Assistant Navil Constructor, U.S. Navy. Boston and New York. Hough-ton-Millin Company, 1913. Price, \$10 784.



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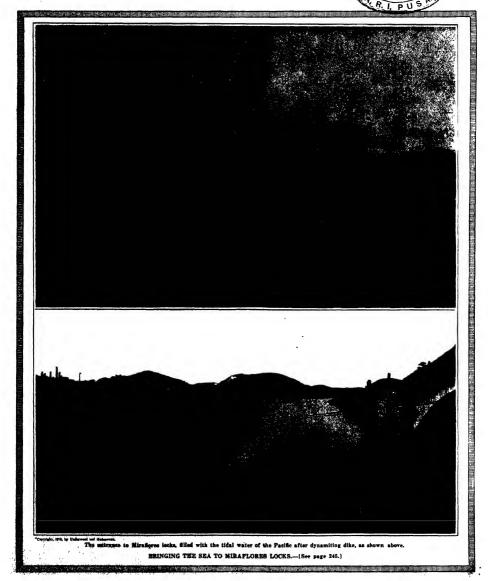
# SCIENTIFICAMERICAN

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NORME CIX

NEW YORK, SEPTEMBER 27, 1913

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### SCIENTIFIC AMERICAN

NEW YORK, SATURDAY, SEPTEMBER 27, 1913 Published by Minio & Co., Incorporated Charles Alten Minio, President Frederick Converse Seacti, Secretary and Treasurer all at 261 Schudway, New York

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His Kilitor is always slied to receive for examination illustrated articles on single to at functs interest. If the photographs are soilly the articles short, and the facts authorite the contributions will receive special alleition. Accepted articles will be paid for alregular since rates.

The purpose of this journal is to record declarately, simula and interestingly, the poold's progress in scien istic knowledge and andustrial achievement.

### The Third American Road Congress

E commend to the attention of everyone who is interested in the subject of transports tion, the meeting of the Third Road Congress, which takes place in Detroit from Sepsuid that transportation and civilization go hand in hand, and even a rapid survey of the pages of history will show that at least with regard to some of the broader phases of civilization, particularly those of a commercial and industrial character, there is a very infimate relation between the two. The masterful and fargighted Romans understood this fact so well that the road builder followed close upon the heels of the conquering army, and from the august city on the Tiber there industed a network of roads. Intelligently hild our and most excellently built, the greater part of which stands to day as a monument to the wisdom and ability of that great people
What was true in the days of the Roman Empire is

trelly true to-day; and we need not go beyond the larders of the United States for proof that abundant and excellent means of transportation is one of the most potent agencies in the development, not merely of the physical but ever of the moral and mental growth of a people. Would it be very far wrong to slate that the most active agent in the enormous male rial development of the resources of the United States during the post built century has been the steam rullroud? If cominge, resourcefulness and hard work alone could have brought about the present conditions of amuzing weight and prosperity, the hardy pioneers who drave their was westward in the rartler years of the Hepublic, would have perfouned the task. But at the most thes could do little more than merely locate the natural resources of the country, and await the day when some adequate and widely-spread system of trans-portation would be available to bring in the skilled and meskilled inborers and carry out the products of

The yest rullroad system of the I pited States, comprising some 250,000 miles of track, stands to-day as a practically completed task at least, so say the lead ng railroad operators, who are best qualified to Judg it now remales to supplement the work of the rull roads by building a system of interconnecting high ways, which will do for the tructs of country inter venlng between the various branches of our railroad system, what the system itself has done for the coun try at large. Had the sidmilian and farming districts ed any means of transportation to and from the ralloads, or between the various towns and from the randoms or netween the various towns must villages, other than the from wagon and the biggs, the call for a system of well-bulk highways would have been imperative. The rapid development of the automobile and the motor track, however, has given an enormons impetus to the agitation in favor of the construction of better highways, and we do not h tate to rank the good roads novement as one of the most important before the American people to-day.

In instification of the foregoing statement, we make certain facts recently recorded in this Journal by Director of the Office of Public Romis In an article unid-shed in our issue of September 6th, Mr. Logan Waller Page drew attention to the following facts. That during the year 1912 automobiles in the United

States outd in registration and thense fees \$5,638,878which exceeded the value of exp mobiles from this country in the whole of 1900; that in 1911 we experted automobiles to the value of \$16,-924,361, exclusive of parts of the machines, and in the following year lise total reached \$23,708,989; that in the same year, we had nearly as many aut-In New York Stale as there were in France and Germany combined, and, finally, that the total number of machines on our highways in 1912 was a round

#### Motor Truck Extension of Railroad

N interesting suggestion for refleving the con-gestion at freight terminals may be found in on mother page. The subject is an exceedingly com-pilented one, on which much could be written, but the article referred to, while giving but a brief outline the simution, offers the novel suggestion that freight terminal problems may be simplified by the use of motor tracks. In a small city the freight terminal is located near the business center and is of such cap ity us to handle all the freight expeditiously and afford ample room for teamsters. But us the town grows the business radius is increased, lengthening the aver age built of the tracks, while on the other hand more freight flows into the terminal, producing congestion, so that although more freight is handled, the profit in it is proportionately less. The larger the city the more valuable is the real estate around the terminal, making it costly to expand the terminal so that it can acco the freight with the same facility as it did in the beginning. To move the freight terminal to new and more commodious quarters, would in most cases be unprofitable to the railroad, because of the pital invested in the original location, and it would certainly be disadvantageous to the shipper or mer chant because of the greater length of haul required.
However, if motor tracks are used lastend of hars

drawn trucks the conditions are completely change for with its ability to cover the ground more rapidly. un extra bant of three or four miles is far less serie in a long delay at the congested freight terminal Delays are advantageous to the horse because the allow him to reemperate, and store up energy greater effort. But the never-tiring motor truck should be kept on the move all the time, because only when it is to motion is it giving any value in return for the enultal layested in fr

Hence, Mr. Niles argues that it might be advantagcons to a ralliond or a group of rallroads to establish or more annex terminals which will divert part of the freight that now closs the main terminals and which would be really accessible to motor trucks. The suggestion calls for a great deal of study, and aithough there are many difficulties that would have to be overcome, it is an exceedingly attractive propositlou il would mean the extension of the railroads to final point of delivery

Because delays to fooding and materdlar floure as dend loss against a motor truck, efforts have been made to reduce this period to a minimum. Trucks up provided with mechanical loading devices, riso with separate bodies which may be founded or unloaded while the truck is in 11 unsit with another body. It might even prove practicable to transport the motor truck bodles fully louded on that curs. A flat cur is nine fee , so that if the bodies were mounted transvers on the car, they could be made at least time feet long which would be ample for the ordinary motor truck The truck hodles mounted on rollers could chassis then be loaded by the shipper, hauled to the ratirond then be longer by the shipper, names to the ratirond, rolled upon the flat cat by means of a which, clamped in position, and there at the other end of the line, be taken off on the motor track chasses in the same way and hanted off to the merchant's warehouse loading and unloading would thus be redu to a minimum, and would prove advantageous not only to the consigner and the consigner, but to the railroad us well, for the curs would be released almost immediutely on arriving at the freight station. Farthermore If the goods were properly packed at the factors it might be possible under certain conditions to deliver direct to the consumer instead of the warehouse.

Another promising development is the motor truck roller. In a paper by Mr. Morgan Citiey, printed not long since in the Engineering Record, it was proved cancinglely that a motor truck shows its greatest efficiency when hauling trailers. In other words, a notor truck can pull much more than it can carry. His tests showed that a 3 ton motor truck could matu tain a sustained draft of more than 3,000 pounds, and that two trailers each loaded with five tons would require a draft of from 750 to 3,000 pounds. His table that the cost per truck mile with a motor and six trailers varied from 0.258 cent per haif-mile hauf to 0.103 cent per ten-mile haul, while the cost for a motor truck alone varied from 0.480 cent to 0.176 cent. By this it is not meant that the motor truck hauls a trulu of six trailers at a time, but only five, wellte black are two loading and two melonding. Theilers are not being made for this purpose, the wheele of stiller wall track with those of the motor truck, so light being in no difficulty in turning corners or threading a way be-tween obstructions. If since a method of handthing freight should prove practical, motor trucks would probably be materially changed in design, because the would not have to support any load except their own weight. Thus we would have railroad freight trains quickly converted into trailer trains hauled by trucks or motor tractors to place of locomotives

### Questioned and Unquestioned Factors in Evolution

IIEN, some fifty-odd years ago, the theory of organic evolution was first widely pub-lished, it met with violent opposition in cartain lay circles, opposition of which threadworn rem mants still remain smoklering here and there. Strange how preconceived and biased judgment will induce men to deny what on closer examination is found to be an absolutely irrefutable proposition, in fact a traisman axiom. For such is the principle of the survival of the fittest of the fittest. It is absolutely uncontroverible, be cause it is of the nature of a definition: The lit sur vives, it could not be otherwise, because we define the fit as that which survives. A mere definition can not he made the subject for argument.

So far then, the fundamental principle of the theory of evolution is unassatiable. But when we proceed to a more detailed analysis of the theory unhered in by Darwin, Wallace, Spencer and others, we encounter a number of problems that are far from being settled beyond dispute at the present day.

In the first place, it might be said, if the principle of the survival of the fittest is a mere definition, then what gain is it to science and munkind? The mere setting up of such a definition adds nothing to our previously existing knowledge, it would seem.

previously existing knowledge, it would seem.

Such an objection seems at first sight reasonable.

No one, however, who is familiar with the laws of schentific thought would be found to endorse it. For it is well understood among those whose life is spent in solving scientific problems, that the first step toward success, and often a siep more difficult than appears on the surface, is the cienr formulation of the prob-lem. Indeed, once the problem is thoroughly understood, its solution is often not far to seek. The great value of the principle of the survival of the fittest, is that it has served as a most valuable guide in direct. ing scientific inquiry.

True, the fit is merely defined as that which survives, but this at once raises the question: What are the characteristics of a given type by virtue of which It is fit? And thus we find ourselves ied on lo a sindy of the laws of mortality, feeningly, selective mating. heredity, and so forth. Nor is this justification of the ciple merely hypothetical the vast amount of work which has followed in the train of Darwin's epoch making publications, and the intensely practical results which have flowed to the plant and animal breeder (to mention only one example), speak more con ingly than the most astale philosophical argument.

in brief, us to the operation of natural selection, and its significance in organic evolution, there can be little But when we approach the question of the terial presented to unture for selection, we find ourseives surrounded on all sides by debatable ground. Does nature select from offspring which differs from its percents by small and gradual variations? If so, has upon earth existed for a period sufficiently long to account for the great changes in biological species which are known to have taken place? Or is the selec-tion made from among so-called sports or mutants, off-pring which for some ill-inderstood reason differ markedly and by a sudden less from its parent? O yet again, is such selection of well-adapted types as d by the luberitance of useful characters acquired by the parent within its life time? Probably each of ctors plays a part in the development of species, but to what extent is an unsettled question

incidentally it is interesting to note that in the case of man, and especially modern man, a new factor enters—the material offered for selection is created by a new process. Variation, mutation, heredity, all Thus the ear seems to have been evolved from a structure corresponding to the gill cleft of a fish. By ture corresponding to the gill elect of a lish. But that arilficial end of undern man, by the sid of which be can hear and understand conversation over a thou-sand miles, is not a physiological product of flesh and shood, but a thing made with human hands. Here we are no longer bound by the fetters of slowly accumpwe are no tonger sound by the Peters, of sowers secular, and a lated variations, how at the mercy of captrious saudie. House, Man is free to give hie genius free play, and as the result the past century has seen used: a food tide in evolution as must be wholly unascended in the millions of years of our cartilla man, history.

#### Electricity

Receive Tan in a Ferfums Shep.—With the object of Incing obsorbmer into his sliop, a perfumery merchant of New Orleans, La., has placed an electric fan in his doorway to carry out into the street the entiting odors of his shop. An attendant with an atomizer sprays the fan with various perfumes.

Telephone from Helland to England.—A submarine telephone is to be laid between Holland and England. The length of the sable will be no less than 105 miles. According to the present project, the total expense will be near \$8,000,000 and will be borns conjointly by the worountries. On the Holland side, the starting point of the cable will no doubt be at the locality of Westkapelle in the island of Waloberon.

pelle in the island of Waloberen.

Spead of Hertalan Waves.—Experiments with Hertalan Waves.—Experiments with Hertalan Waves between Toulon and Paris by Mesers. Abraham Dufour and Ferrié show that the waves travel with a spead of 295,990 kilometers per second. The spead of light waves is 200,000 kilometers per second. The Rapariments are now to be conducted to determine whather the spead of Hertalan waves across the sea is the same as that over land.

the same as that over land.
Wiesless Trials Dispatching.—After a careful investigation the Superintendent of Telegraphs of the Atchison,
Topelss and Beats & F. Kallway has come to the conclusion that it is not advisable to install wireless telegraph appearates along the realized, not only because
of the expense of installing and maintaining the stations,
but also for the reason that wireless telegraph communication can too easily be interfered with to make
it sufficiently reliable for railroad use.

The Largest Electric Mins Holst, says the Electrician (London), is being installed in 8 South African mile A shaft is being equipped with a 4,000 horse-power boist to be operated on the mains of the Vistoria Falia Power Company, without any attempt at equilatation of the maximum and minimum power demand, which means that the motors will require something like 7,000 horse-power during acceleration, resulting in a load of 9,000 horse-power on the transmission line. The equipment will consist of two 2,000-horse-power continuous-current motors, one at each end of the drum shaft of the holst. The motors will receive current at 5,000 volts from a motor generator converting the 65-cycle 3-phase current to continuous current. The motor species of the converse induction motor generator converting the 65-cycle 3-phase current to continuous current. The motor generator will comprise a 5,000-borse-power 3-phase induction motor, operating on a 2,000-volt circuit, directly coupled to two separately excited continuous-current generators, each of 1,650 kilowatte capacity.

Magnetic Separators.—In different kinds of granding mills it is found that fragments of rion cause disasterous explosions, as for instance in an English oil works where fron turnings in the mills gave sparks which set fire to the inflammable material. A number of works in Europe, and especially the ones which suffered from this class of secident, are making use of magnetic separators in the shape of revolving drums. Inside the drums are powerful electromagnets which cause the fron particles to adhere to the surface of the drum, so that the pieces are taken up and delivered over to the other died where a suitable scraper takes them off. In the improved types, the inside magneta have as winding of aluminium wire, self-insulated by oxide, so that the colls are heat and moisture proof and the devise is very reliable. Such magnetic separators are recommended for cocco or bone mills, chemical works, coal crushers, sugar refineries and grain mills, as well as in the textile industries. We may mention one case where iron particles caused a fire in a Wurtemburg spinning factory, where \$20,000 worth of cotton was burned. This class of works, together with oil milis, appear to be the most in danger from the presence of iron particles.

presence of iron particles.

A Historic Gavel.—At the opening session of the Illuminating Engineering Society in Pittaburgh, on Sept. 22d, Prof. George A. Hoadley of Swarthmore College presented to the Society on bending of the Philadelphia section a gavel that forms a miniature achibit of the development of artificial illumination in America. The candle is represented by a tin handle from a candle making apparatus; the oll lamp by two pieces of iron obtained from a bracket, the design and making of which were supervised by Bengiamf Pranklin; the gas meantle by a vial containing the original Weisbach lighting flutd, under in the Weisbach laboratories in 1888; the arc lamp by an electrode used in the first magnetic arc lamp in 1903; are lighting by a piece of single conductor cable installed by the municipality in Philadelphia for are lighting about 1890; the incandescent lamp by a 6th that Thomas A. Edison used in his sarty experiments in making paper flaments in 1879; the vacuum table hamp by a piece of electrods of one of the Moore-light violum; tubes, exhibited at the first New York societies above in 1809, lighting service by a piece of the first Edison Service side installed in Philadelphia; while has a fedurator in the complex of the first Edison Service side in the state of gladelphia; while he are installed in Philadelphia; while he are

#### Science

The Seventh Centenery of Reger Bacon's Birth will probably be celebrated in England nast year by the erection of a statue in honor of this serily champion of experimental science, in the Natural History Museum at Oxford, and by raising a fund for the publication of his works.

The Buyz-Ballet Medal of the Royal Academy of Sciences of Amsterdam, which is awarded every ten years for distinguished work in meteorology, has just been granted to Prof. H. Hergesell for his investigations of the upper atmosphere in subtropical and circumpolar regions.

A University for Central China.—The augmenton to establish a university on cocidental lines in central China is accounting much interest in Greet Britan, where the contral china is accounting the same of \$250,000 from the scattering the same of \$250,000 from the Company of th

Solar Observatory in New Zealand.—The long-felt need of solar observatories in the southern hemisphere has been met in recent years by the establishment of such institutions in India and Australia, and now it is anounced that one will be established shortly in New Zealand. The funds for building, equipping and endough the new part of the property o

The Metalf Count Observed by Brooks.—The now omat recently discovered by Mr. Joel Metalf has been observed by Dr. William R. Brooks at the Smith Observatory, Geneva, New York. It is in the northern sky just above the bead of the Lynx, and its motion a northerty. The comet is telescopic, rather faint at discovering the support of the support of the country of the supposed to the Sun, cocurred on September 14th, in position right as month of hours 10 minutes; declination north 07 degrees 12 minutes.

The Sames Observatory at Apia, originally established in 1902 as a temporary piace of meteorological and gen-physical observations in connection with the international antaretic expeditions, has gradually assumed a permanent status and become the most important scientific institution in the South Seas. It is conducted under the suspices of the Royal Bootley of Sciences at Obtimizes, and supported by the German government, which has just authorized a substantial increase in the revenue of the institution. At frequest interests and widnesses on the total control of the co

As Exhaustive Study of the Cartia Family, with respect to taxonomic geographic and economic features has been undertaken by the Department of Botanical Research of the Carceger Institution, N. L. Britton, director of the New York Botanical Garden, and Dr. J. N. Rose, of the Smithsonian Institution, being in charge of the work. Dr. Rose has been studying the great reollections of Castoseen in European The field work will begin with an exploration of the West Indies and the north coast of South America. The field work in the deserted of Argentina. A large number of volunteer collectors and botanists in the southwesters United States, and about twenty (Jovernment supploress, are seeding in material. Two or three years will be apent in assembling and organising the collections. A series of volumes dealing with these highly specialized plants will be published.

Work of the "Anten Dehrn."—Dr. Alfred G. Mayer, director of the Department of Marine Biology of the Carnegie Institution, calls attention to the broadening of the work of his department made possible by the acquisition of a stemen 70-1t. twin-ever yacht, he' Anton Dohrn." The whole West Indian-Florida region has been opened to the southiest of Dr. Mayer and his staff, and it is proposed to commence a series of biological oceanorpship researches embracing the interesting region of the Carlbbean Sea and the sources of the Gulf Stream. Afreedy a order of 570 miles has been made among the Bahamas. Thus we have in America a parallel to the remarkable softwittes of the "Mishel Sam" in European waters. Dr. Mayer keyz: "It should be a source of reget to us in America that our country, which during the nid-decade of the nineteenth country under Maury and Bache led all others in the selectific study of the sea, should sow have fallen into an insignificant place in such researches. Our country, which fostered he labors of Leuis and Alexander Agassia, and of Pourtalès, Signess and Searchuse (sic) respecting this important field of study."

#### Aeronautics

The 1913 Gordon Bennett Balloon Race.—The spherical halloon commusion of the Acro Club is occupied with organizing the Gordon Bennett Cup event, which is to take place in October. The following prizes will be awarded. First prize, known as City of Paris prize. \$2,000. Second prize, \$1,000. Third, \$500. Fourth, \$300. Fifth, \$200. Also objects of art As usual, the start will take place from Paris

Competition for Highest 1913 Total Mileage.—Several of the French acceptance pilots are competing for the sup-which is to be awarded for the longest total distance covered before December 31st. Fourny is at the head of the last at present and has been making flights every aday in the region of Paris for the last two weeks, having at last accounts footed up 9310 kilometers (about 570 miles)

The Michella Bomb Dropping Centes. - The several part of the scenal larget contest for the Mechan purior \$30,000 held during September shows some interesting conditions. The rules call for the placing of 15 abot or imitation bombs of 6 unch diameter and 15 abot or imitation bombs of 6 unch diameter and 15 pounds weight, with seroplasse philips at 200 meters (656 feet). The target traced on the ground is a circle of 66 feet diameter. Different zerordowne shave entered pilots for the tests, there being the Farman at Buc, with 9 pilots, the Stamps accordowne with one Farman seroplane, and the Chalons and Vidamée, each with one pilot. Six of the competitors are army offices.

The Bonnet Prize for an Automatic Stabilizer Performance. In view of the progress which is being made in the way of automate stabilizing for aeroplanes, the National Averal League of Paris is promoting the question Engagements are now open at the League for the latelyfounded Henri Bonnet prize, to be awarded to the first plot fluring in a wind of at least 15 feet per second, is able to cover a distance of at least 12 miles without touching the levers for the vertical steering ruidder or for the alterons. The horizontal steering ruidder is to be independent and can be used on the occasion, as the object to to have an automatic stabilizing in the vertical

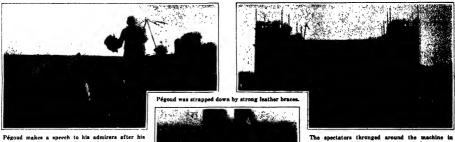
Monoplanes and Bijanes Compared.—For newplanes of equat span, cross-section, aspect-ratio and angle of inclination, the monoplane has about 15 per cent more lift than the lipiane for equal speeds, according to F Handley Page, the English designer. A monoplane has a smaller resistance than the corresponding biplane, a support of the section of the se

The French Gordon Bennett Competition. The following are the competitors which were drawn by tot at the Paris Acro Club for the Gordon Bennett Cup eliminatory trais for acroplanes. Dependines monoplanes will be monited by Prevoya, Gilbert and Rost, Bardi monoplanes by Denocut and Chemet, one Brögnet biplane by Brögn, a Nieuport monoplane by Espanet and a Pomer monoplane by Vedrines. The trais take place September 26th, and the rules call for a run of 60 miles Competitors are allowed to make three trasts and to choose the time of starting. The first three acroplanes classed in this event and offend the French colors in the Gordon Bennett raws, which is fixed for September 20th, which the next three plots will form a reserve.

War Experience in Air Scouling.—Both in the Tripolitan and Balian campaigns the aeropiane was used with good effect. In Morreco air scouling frustrated ambushes, forestalled unexpected attacks by superor numbers, and alleviated the mental tomson of the commanders, because they were always enabled to know the strength of their Arabic and Turkish encemies. All this was merely of a defeasive nature, for the character of the country and the climate made it impossible to decide the war by was offensive operations in which the air soon might have been all-important. The aeropiane might have played an important part in the Balians had the aviation corps of the allies or of the Turks been propared. Unfortunately, they were not organized to move with the field forces. Like sage artillery, they reached the front list. What they really accomplished is still the secret of the observer-officers and of the gene al staffs. The pilotos of the machines were not taken into the confidence of their passenger observers. Indeed, they often compliance that they were acting bludly, and that they could not perform their functions efficiently as a consequence. In a seuse the air service in the Balkans was at times of a defensive nature. It frustrated salhes from beinged fortifications because the air scuts saw what was coming and could notify their commander to prepare themselves. Although not decisive factors in the war, the machines become indepensable. Any news about the aenew appears indepensable.

### Turning Somersaults With an Aeroplane

The Remarkable Exploit of Adolphe Pègoud



Pégoud makes a speech to his admirers after his second somersaulting performance.

N hist week's issue of the Scientific American, In the weeks resource to the performed by Adolphe Pégoud in jumping from a fiving aerophaic with a parachute. Since that exploit was performed, Pégoud has accumplished the still more extraordinary feal of turning a somersault in the nir in a Bierlat monoplane Pégoud performed his somersanit twice, once at Buc on er 2nd, and ugain ut Juvissy on the following When the news was first cabled to this country. cay when the news was nest collect of this country, experienced aviators and designers shook their heads in doubt forville Wright, for example, was quarted as one of the skeptics. He pointed out, with others, that the gravity fuel feed of the aerophane would be cut off as soon as it was turned upside down, so that even a short journey in an inverted position seemed

or all that the feat was anquestionably perform as the accompanying photograph showing the machine unide down administratives. That it was accomplished at all is due to the fact that it formed part of a rol plane. Mr Wright was absolutely correct in stating that flight in an inverted position could not be maintained on a straight line for any considerable

The Bierlot monoplane used for these acrobatics was The inertor monopane used for these acrobatics was a single-senter of the XI type, built in 1912. The position and height of the upper rabate was stightly modified and the bracing of the fixed tail plane was reinforced. As one of our illustrations shows, Pégond. was strapped into his sent with leather braces passing over his shoulders. Rising to a height of 3,500 feet, Pégoid cut off his engine. Turning the nose of his machine down, he dropped almost in a verticul line. At a height of 1,600 feet

he putled his clocke and forced the muchine on its back. Thus he glided for five hundred yards at a slight downward angle Again Pégond worked his The machine as sumed a vertical position again for a few seconds. then straightened out in glide, and rame to cartle in its normal position

Pégoud states that while he was flying upstde down gasoline leaked drop by drop out of his fuel tank, and fell into his face The draft from the propeller blew it all over him like a spray "It was just tike being to a burber's chair upside down," was Pégoud's reply to the ques-tion: "What did it feel

It might be supposed that Pégoud is a inridened aviator. As a matter of fact he is only twenty-four years of age and took out his plot's certificate on February Sth last.

In our issue of May 31st, 1913, we recorded the somersault of Capt. Aubry of

the French army while flying a Deperdussin. The captain was flying against a wind of about twenty-two miles an hour At 2,500 feet, a series of violent gusts struck the machine. He was obliged to dive in order to sive gusts struck the top of the main planes, and placed him in a vertical position While endeavoring to man-ipulate the elevating rudder, he found the machine had nomine the elevating rudder, he round the machine had taken him in a perfectly vertical drop to less than 1,500 feet. Here it assumed a horizontal position upside down and proceeded to effect a tall-first vol plunck Somehow the pilot retained his seat. The machine then gradually assumed its vertical position again. Fiatten ing out, the captain flew to a spot about two miles dis-

Pégoud's feat is more remarkable becau liberately performed, not only once, but twice, l'égoud's performance has any value whatever, it she that monoplanes can be so constructed as to withstand even abnormal strains—it also shows that a pilot with n cool head and perfect control of his mach save himself even in a most perilous position if he is high enough from the ground.

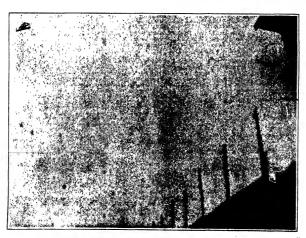
### The Nature of Radio-telegraph Waves

I N a paper read before the British Association for the Advancement of Science, Prof. G. W. O. Howe,

M.Sc., states that a very clear conception of the nature of the electro-magnetic waves employed in radio-teleg raphy can be obtained by considering those electro-mag-netic waves which exist in the space between the two conductors of a single-phase transmission line. If the conductors are fint, parallel strips, close together, and connected at the sending end to the terminals of an alternatur, there is a certain value of the non-inductive load at the receiving end which will absorb the arriving energy without any reflection. Under these conditions the current and voltage are in phase all along the ine, and the same is true if the line is assumed to be of infinite length. Line resistance and leakage are assumed to be negligible. It follows from this that the electric and magnetic fields at any point have their maximum values at the same moment. Instead of two maximim values at the same moment. Instead of two parallel strips transmitting energy to one direction, two parallel disks of infinite extent can be imagined with the alternating PD, applied between their contern. Energy would then be transmitted radially in all directions in the plane between the disks The earth could take the place of the lower disk, while the upper one could be represented by a conducting horizontal plane some distance above the earth. The waves produced would be truly cylindrical, whereas those employed in radio-telegraphy are spherical. If, now, the upper disk is replaced by an inverted conducting cone of infinite extent, with its npex almost in contact with the earth, the alternating PD, being applied between the apex and the earth, the electro-magnetic waves will be almo identical with those employed in radio-telegraphy and will vary in the same way with the distance from the sending station. This imaginary multi-directional trans

which Pégoud turned som

a lower plane (the earth) and an inverted cone, lends itself to simple calculation, because, like an ordi-nary transmission line, and unlike the two parallel disks, it has a constant inductance and capacity per mile. If the angle between the cone and the earth is 70 degrees, the relations between the magnetic and electric fields near the earth's surface and the total energy radiated are identical with those existing in the ordinary radio-telegraphic wave. As in the transmission line already considered, the current and P.D. will be in hase at every point, and therefore, the horizontal magnetic field and the ver-tical electric field due to a sending antenna are not 90 degrees out of phase but approximately in phase, except immedi-ately about the antenna. This also follows from the fundamental equations of a progressive, as distinct en a stationary, electro-Tring out to mile



This unretouched photograph distinctly shows Pégeud flying speide down.

in this Borough: There is like a meeting of Suffragists on Sursay (22) m

Daw hom then auxions that you should have this speeimen of my handeritain as

No. 1.—A woman with diplomacy, tact, and administrative talent.

with reference to the footion. They remains the Hoston they remains the state of the list.

No. 8.—This writing indicates carelessness, confusion of thought.

lead twenty - are experiences; references if have interview, by truly yours

No. 4 .- Order, system, punctuality are shown.

perposition. Hence it water another Milk thanks

No. 5.—Clergyman with gift of raising money type showing the qualities of an executive.

I just wish to on of you. I con-I lian. You have

No. 6.—The writing of a crook—one who is thurenghly disherest.

I attended the fights last Salunday my Coul I am gled to day

No. 7.—Craftiness, cunning, lying, and cowardice appear.

Mark Areas Services

Handwriting and Human Efficiency A Psychological Survey Based

Upon Facts

By William Leslie French

In this country the Science of Graphology has been utilized but alighily until very recent years. And the reason for this is that its practical application to the conditions which make for human efficiency has not been tested or recognized to any marked degree. However, many who have investigated this method for analysing character, montal and bylacial traits and teadencies, have absolutely become convinced of its great utility.

In this connection the oridance offered by a well-known corporation lawyer is perjoint. Whenever it is necessary to secure complete information concerning the character and habits of witnesses," he states, "I rely particularly upon the data furnished by a graphologist in order to safezuard my clients' interests. In a recent iswuit tuvoiring many thousands of dollars, this efficiency expert demonstrated from when the records that the person under cross-examination—prominent man—was first and foremost a liar and a crock, that has statements where called to retrify would be false. Later he strengthened his remarks by priviling that the witness had forgred his signature. This evidence proved to be correct in detail. Within twenty four hours tilb witness had fide to parts suknown:"

four hours this witness had field to parts unknown: To give an illustration, a few months ago, in the office of one of our large corporations, the secretary of the firm said opening his mail. After consigning a number to the weste-basket, he uttered an exclamation of diaguat. "Well, ill he juggered! I advertised in the paper for a bookkeeper and these are what I get This is one sample"—showing a letter across the flattop desk. "Tid not a handwriting expert, but if this fellow's writing does not show his lack of flatess, till resign my jostition. And this is not any first experience by any means. Every firm is un against the same proposition. Half the time, if the references are good, the man is crocked or given to bad habits which make

proposition. Hair the time, it the references are good, the man is crocked or given to bad habifs which make him worthless in the long run. Number three is the letter. Note the general style, Irregular, careless, somewhat erratic, with the junctual content of the proposition of

Number four is a marked contrast, as anyone can see This individual is orderly, systematic, cautions and industrious. The style is uniform, with punctuation carefully piaced and the small letters even in height and pointed at the top. The long letters are well developed above and below, the "t" crossing being No. 2.—Salesman with a vivid imagination and with the quality of evasion.

no being of The variety, necessata The line for

No. 9 .- The liar and one using underhand methods

Je might be me . Dropin as I have a pel celiforing moch

No. 10.—Type showing honesty, reliability, sincerlty and ability for banking or similar work.

so rusked, and In to speak to you about matter that concerns very deeply

No. 11.-Woman with a straight mercantile con-

I don't know

No. 12.—Excellent salesman; much assurance is shown and gift for closing a deal.

And Pelate paid "What I have puri have written"

No. 13.—Gentle, type not fitted for selling goods.

I have spoken on this subject

No. 14.—This writing indicates mechanical and englacering inclinations.

11 Biroling, New York Ciz-

No. 2. Salarana with pressure approximates and self-confidence

bours very tuly

No. 15 .- Man in perfect physical condition. Note the large loops of his "y's."

to pariginal ...

neither at the right not left of slem. A person se signs would be able to occupy any position which requires ubility for office work, backkeeping, banking or similar lines. He would be industrious, punctual

and do his daty at all times Number one, the writing of a woman, helrnys her forceful way of blinking, as appears in the connecting stokes, the "t" crossing and firm pressure. Her tact is found in the first small letters of words being larger at the beginning than at the end. An occasional break between letters as in "borough" gives her intuition, a raluable adjunct which many successful executives also have. A clergyman who is amuzingly skillful in also have A clergyman was a managey satisfactoristing mose for the projects wrote specimen five. His self-confidence, will-power and ambition, signified by the heavy pressure. "I' has sloping discovered the right, and apward pounding of his words across the page, combined with the fuel and diplomucy signs us before, force blin lute the executive class, despite himself, as it were

There is a saying that he who does not write straight will not think straight, net straight, or be straight So to the writing of number six appear all the pensigns which mark the crook at heart. Observe that the lines audulate, the small letters varying in height and size, of which some are close ingefier and closed.
The spaces between the lines are not very even, and The spaces netwern the line are not better the finds are rather abrain. Should the occasion arise, a person possessing these hall-marks would not hest tate to jugate petty eash, butnige in check-killing, or lake graff at every opportunity.

In specimens numbers seven and nine appear two an ejectment numbers seven and thin appear two other types of writing which throw them very closely into the same class. The signs are alike, though, as anyone can see, the slyle of both is markedly different The first is a good example of a person who would be crafty, use canning, and cover his tracks rather suc-cessfully. Though his cowardice is shown by the feeble pressure, he could lie skillfully, for his "a's" and "o's" are tightly closed, the small letters being pointed at the tor. The second is another who, on account of the top. The second is inducer who, of necodal of writing backband, has a natural feulency to devious uces, while his ubility to the shows in the looping of the "o" in "of."

How strikingly different are the scripts of numb Both individuals write a straightfor ten and eleven ward hand with no ways movement, small billers changing in height and size, or the spacing between changing in negati and size, or the special between these and letters uneven. Each leaves plenty of room between the letters and the fluids are not cal short. Thus, honesty, sheedly, truthfulness, frinkness and adherence to duly are received. In any form of work, people who exhibit such peudralts can be relied upon people who exhibit such pen-traits can be reded upon to perform every function without being "packed up" by the manager of the office Writing at the angle of forty-like degrees, the pressure being even throughout, endows such with a mercantile conselence which per veuts any destington whousees. As handwriting thinks of a brandwriting indicates moral collections, it also reveals the values kided over the work for which people are reveals the values kided over the wheel people are

fitted, along commercial lines, of which the following ure additional examples

if it is necessary to engage an individual for the position of a salesman bond, advertising, real estate or insurance—the general features found in numbers of hostinuce—the general returnes forms in numerics two, eight and twelve will appear. As you will note, these specimens are quite dissimilar in style, but the mental instedients are there. Each pounds the paper with force, energy and determination, as is shown in henvy, hold, uniform pressure throughout The big generous capitals give self-assurance, confi dence and a helief in their own ability to succeed, which is increused by the high looped letters above the lines us the "h's" in number two, the human brouco-break-ing capitals "I" and "P" in number twelve. All give ring capacities. It add to the monoce to wheather the writers handlandout, the power to wheather the proposition which they may be exploiting, and then concline others. To be suite, they close their small bits mult os? The issuit sign of secretiveness, but in these cases it merely signifies that they know when is keen their months shut-an excellent sign in a sales

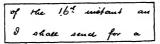
Anyone can see that the nerson who penged number thirteen has about as much self assertioness as an anemic kitten trying to cut down un ouk. He crosses his "ts" in that quiet fushion which shows that he would present a business scheme or plan so quietly that the average man would have an engagement for that the average man would have an engagement for unert. The delicacy of his writing and pressure de-bars him from selling 'blue sky," accommanded by the fact that, and his predictors, his script has no curved base-the the skyn of being rable to evade the mestion or dube a carbons and periment customer. This skyle indicates (finality. Would you care to employ this type to sell goods?

As engineering, invention and creative power play an important part with corporations la-day, it is of interest to learn what grokes in combination show capacities in these directions.

Where a person has naturally a scientific bent, you

will find that the writing is, as a rule, perpendicular, backward or sloping slightly to the right. The small letters will be low, pointed at the top or square, and the connecting strokes of words and letters well formed Frequently, they are shaped like figures or chemical signs, angular rather than rounded. (See especially er fourteen)

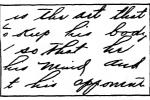
Examples fourteen and sixteen are excellent types of Examples fourteen and stateon are excessed types of persons who have a natural gift for mechanics and engineering. The first gives every sign, the second betrays the same formations, but the power of concentration is remarkable besides, indicated by the small



No. 16.—Electrical engineer or one who would do well in this class of work.

precisely-formed low letters This man's mind would apply liself to minutize to an extraordinary In contrast to that of his companion, number fourteen, his metier would be electricity in preference, because critical investigating trend shown by the small letters pointed at the top and the sharp up and dawn strokes, as in "f" and "y." He does not possess us much liking for rugineering problems as the other, since his "h" does not extend so far above the baseline.

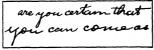
ed health is the first requirement for a man to do effective work, enabling him-all other things h ing equal-to hold his position and to advance Speci-



No. 17 .- This individual is a drug fiend. Formerly a fine athletic anecimen. Mornhine or onium fiends show the same signs.

men unmber fifteen presents a perfect billet of health. serfe for may insurance company to passe un, for the even, sleady flow of the wriling, the firmness through out, and the well-formed rounded curves below the lines, signifying n love of athletics and outdoor sports "y's"-all betray physical exuberance and vitality-a man who is in fine physical trim

Now look at number seventeen, and see if to the naked eye one can spot any difference with that above. Apparently, there is the same kind of pressure, and like curves below the lines. But, unfortunutely for the writer, there is the remarking of the strokes in



No. 18.—This specimen shows all the combinations of small "s's" and "o's," indicating secretiveness and caution.

'art," "so," and in the last half-obliterated word, re veals, under the glass, that this individual is addicted to the excessive use of cigarettes and morphise. He is u big, sirong, husky fellow, naturally as powerful as a hull, but beginning to weaken. He lost his position a good one—because he was too singgish and sleep (in the surface, he appeared to the average onlooker to

In reading the characters from a given specimen the following additional rules should be ob

Where strokes constantly appear it indicates a natural and strong characteristic. A stroke which is occa slountly seen betrays an occasional trait, while one

No. 19 .- The large loops of the letters above the line indicate highly developed imaginati

which appears regularly and is exagge abnormal characteristi

abnormal characteristic.

The general signs which have to be considered at the foundation of this science are the manner in white a person makes his connections, whether the writing is large, small, or intermediate, round, sharp, or angular Writers who make their capitals large, with the

wraters was made their capacity args, with the small letters high, possess a desire to do great things, are enterprising, independent, and take pride in their achievements, and are liberal in their views. They are better at generalities than fitted for details Many extravagant spenders write a large hand sh wide spaces between the lines and letters.

Small writing gives the writer concentrate the power of attention to details, with carefulness, a fine of observation and a good critical faculty, es sense of observation and a good errical actuary especially if the letters are sharp at the top. The capitals may be either small or large, for their height has a different significance, which will be touched on later. Where the small letters are neither too high nor too

the intermediate class—the individuals are well low—the intermediate class—the individuals are well-behanced, usually, with the qualities of good judgment. Intellectual and material order, a fair amount of co-contration, and practical common sense. But the reade-must remember that other signs may modify these

People whose writing is sharp, with clear-cut cor-ers, have much power of resistance, some of their ners, have much power of resistance, some or tractirative long rudeness, severity, sectionability and temper. Those who pen a well-rounded band show the opposite characteristics. Mildness of disposition appears, and such writers are easily influenced by others, their power of resistance being less.

An individual who reasons clearly, showing a logical

mind, will form his connecting strokes carefully and even with a good deal of originality, there being practically no breaks between the letters of words. Sometimes there are additional signs, such as words being connected, also. The strokes of one line will not interfere ith the others, while a fixed style will be shown.

The slope of the writing is a most important feature.

for according to the slant you can determine the amount of affection an individual possesses. The normal slope

is close to forty-five degrees.

The "t" dushes pluy an important part in affecting person, character, and disposition. In many cases are the sign of temperament.

If the stroke is long, rupning upward, ambition, seal If the stroke is long, running ujward, suntion, seen, love of enterprise, and enthusiasm are signified. Montal energy appears when the crossing is dashed to the right, frequently downward. When the "t" bar is blunt stubboraness is betrayed, the man who will hauge on and stick to his purpose. A long steady stroke across the "C" stem shows deliberation and moderation. Will power also appears A weak, flashy stroke hetrays vacilation and little will to achieve, the person being easily influenced.

The capital letters are also very significant. When the capitals are very high and large this shows cone and vanity, and linese qualities are exaggerated if flourishes appear. The lower the capital the less pride there is. If the first stroke of the "M" is higher than the others, independence, pride and social ambition are shown. This applies to the "N" and "W" also. When the outlines of the capitals are well formed and not loo elaborate, simplicity; and artistic ability is shown

by curved and print-like formations, usually shaded.

The final strokes of letters give much valuable in formation, and are one of the most valuable clues to Abrupt flusts show selfstmess. When they curve upward and outward, generosity and sympathy. A terminal stroke outling in a hook betrays perversity, one which would cause the writer to insist on his own ideas being carried out. A straight down stroke at the end of a word shows secretiveness and also a tend-

ency to be skeptical.

The small letters also have a special significance, and for convenience wike can be thus classified:

for convenience sake can be thus classified:

a Long letters which extend far above the baseline and are looped, especially ""k" "da" and "f"," give
imagination, also un toterest in things pertaining to
the mind rather than practical affairs. The looped
"t" and "d" give garrully, and if open at the top
they are the size of extreme talkativeness. The sharpening of long letters in this connection betrays reserve, and sarcasm, especially when the "!" is pointed. (Numter eighteen.)

When the letters, such as "y's," "g's" ar extend well below the baseline they rowed, when firm or made with a rounded curve to the right, excellent vitality and a good constitution. My interpretation

viality and a good constitution. My interpretation does not signs with some authorities, but I have always found it to hold good. "vie" and "g's" are tightly closed, secretiveness and caution are found; when they are upon at the top the tendency to talk too much is shown; and when they are looped—from; (Neunderinstease,). The backward stroke to the left of the "d," or, in this.

any stroke of this formation shows ampli (Number mineteen.) Service Additional Commence

### Correspondence

The officers are not responsible for statemers with the the correspondence column. Assumence constitute that the names correspondents will be withheld whom so desired.]

### Snake Imbedded in a Log

To the Editor of the SCIENTIFIC AMERICAN:

One day recently my sawyer while quarter sawing a 48-inch white oak log, found a snake about one half noh in diameter imbedded near its center. The wood was sound and at first it was a perplexing question how a snake fully equipped for business had come there, but was sound and at nev it was a perpiexing question now a maske fully equipped for business had come there, but after investigation, I reached a satisfactory conclusion concerning it. It appears that when the tree was some three feet in diameter, a fire had been placed about its cares rees in diameter, a life had oeen placed about two roots and this had partly killed one side to the height of about two feet above the stump, but a new growth and completely covered the wound. In felling the tree the dead part, being perfectly sound but brittle, sud-denly gave way and splinters from the live part, some of semy gave way and spiniters from the live part, some or whem three or four feet long, adhered to the stump. The snake, no doubt, entered the log through the spaces made by the splinters, and was not able to extricate itself. The dampness of the river bottoms added by heavy rains caused the seasoned part at the end of the log to expand and thus entirely closed the aperture through which the snake had entered.

DELOS H. BACON.

### The Destructive Effect of Bullets

To the Editor of the SCIENTIFIC AMERICAN Quoting from the article "The Other Side of War, on page 162 of the August 30th issue of your esteemes publication, the assertion that, owing to increased rotation, the bullet acts not only as a club, striking a heavy blow, but also as a gimlet which lacerates the

heavy blow, but also as a giniet which lacerates the tissues, seems to stand in need of correction.

In order to produce a gimlet effect, the bullet must either have the shape of a gimlet or it must describe a spiral during the set of penetration. The former is a spirm during the sect of penetration. The former is out of the question, considering that the ridges made on the circumference of the bullet are trifling and run almost parallel with the length axis. Moreover, if we investigate how many turns a bullet makes in perforat-ing a human chost of say 9 inches diameter, the answer will be surprising to anyone thinking only of the enormous number of revolutions which the bullet makes during number of revolutions when the bullet makes during the whole path of its flight. As far as I have been able to inform myself, there is not a single small-caliber gun in existence, whether rifled at a uniform or increas-ing twist, which would permit the bullet to make more

ing twist, which would permit the bullet to make more than 1½ turns within the barrel, i. e., for an average path of about 36 inches. Since the rotational velocity of the bullet cannot possibly increase after the bullet has left the gun, but, possibly increase after the bullet has left the "gun, but, on the contrary, decreases rapidly as the bullet proceeds, it follows that the bullet, in perforating 9 inches of a human cheek, has made one quarter of one items within the chest! How can that produce or ra'ce isilly affect the laccration of the tensure.

In my mind the action of a rotating bullet could be better compared with that of an and, which as every-body knows can be passed with loss effort through, o. g., a number of layers of leather, if we rotate the handle. But the hole thus made would, if anything, be smoother than if we were to omit britation.

nance. But the nois truis made would, it anything, be smoother than if we were to omit rotation.

If, therefore, wounds made by small-saliber, high-velocity bullets exhibit any particularly destructive effect, it must be due to causes other than "gimlet action" of the bullet. Of these causes, one of the most action of the outset. Of these causes, one of the most plausible has been omitted in the explanation of Dr. Helme, to wit, incompressibility of liquids and semi-liquids. If a high-velocity bullet enters the cranium, the addition of the volume of the bullet to the (nearly) incompressible contents implies a sudden increase of pressure within the granium, possibly the equivalent of many atmospheres of pressure, which, though lasting of many atmospheres of pressure, which, though lasting only an instant, is capable of fully explaining the de-structive effect. Similar conditions prevail in the case of the human baddy: Contrary to the popular being, excepting only such pathologic cenditions which have expended the formation of gases, the bladder mover con-

caused the formation of gases, the bladder never contains air and liquid, but expands in proportion as the liquid accountate. If the liquid is confided, its walls collapse and are in a state of closest approximation. If a builder enters a filled bladder, the inertia of the walls prevents a correspondingly rapid expansion; because of pressure within the bladder and enormous increase of pressure within the bladder. Because of the wall-known advantages of a flatter triplertory, the avoidance of e-coalled "windage," and, penalty, the avoidance of "sumbling" of the builts, the rifining of gass, and with it the resistion of the small-coalline builder, does not add to the "oriently" of the friends. pis made. Mobuspi, Pa. A. StOMARK, M.D.

#### The Ten Greatest Inventions

W HAT are the ten greatest patentable inventions of the past twenty-five years? The Inventors Prize Contact which closed on September 1st brought Prize Contact which closed on September 1st brought in a large number of essays, but no two agreed on the ten greatest inventions. The wide divergence of opinion is shown by the following list, taken from a selected dozen of the essays. Furthermore, a poll of the editorial staff failed to show perfect unanimity on more than six inventions. The Editor is interested to know the opinion of readers of the Scientific America can on this subject and invites every one to send in his Here is the list, and quite evidently it include some that are not patentable, and some that do not properly belong within the 25-year period, but the reader must decide for himself which should be avoid-Acetylene gas from car- Kodak.

Liquid air.

Monorall.

Mercury vapor hamp

Motion pictures

Photo-engraving.

Preumntle thre Producer-gas Preservation of sugar-

producing plants

Transmission and trans forming of alternating

Submurble boots

Tungsten lambs

Pasteur's work

Aeroplan Automobile Burbank's works. Calculating machines. Color photography. Concrete (reinforced). Dictograph. Diesel engine Dirigible Electric furnace. Electric welding Fixation of nitrogen. Flexible photo-film. Incandescent electric

Induction motor Internal combustion engine.

Weisbach burner Wireless telegraphy X-ray muchine

Pick out the ten best inventions in the list and send them to the Contest Editor before the 18th of October The result of the vote will be published in the SCIESTIFIC AMERICAN of November 1st. This number will also contain the essay winning first prize and the aunonnement of the successful contestant

### Two Trips Around the World

TVER since the time of Mugelbin, the journey around the world has held great attractions for travelers, and with the development of steam unvigation, coms-confinental railways, and all the modern auxiliaries of locomotion, the time required for the trip has been continually reduced

Nearly fifty years ago Jules Verne crented the character of Phileas Fogg, in his story "Around the World in Eighty Days," and since that time this imaginary trip has been followed by actual journeys of briefer

The desire for speed, however, seems to have reached limit, and although it is probable that still further eductions may be made in the time regulared to make the circuit of the globe, the relation of the iluration of the journey to its value may well cause the que tion of real usefulness to be ruised

In particular we may mention two voyages around the world, the latest having been made by a phuble American journalist during the present year, and oc-cupying about five weeks, and the earlier one made eighty years ago, by a young man of twenty-two, and occupying five years. The former traveler had the advantages of the modern high-speed ocean steamship. both on the Atlantic and on the Pacific, besides utiliz ing the trans-Siberian railway, the railroads of Korea and of Japan, and the special efforts of the transcontinental railroads of the United States. The latter made his entire trip in one vessel, the voyage having the original object of carrying Greenwich time to many blands of the sea and thus enabling their precise langitude to be determined; but the voyage of the "Beagle" will always be renaembered because ('harles larwin was on board, and because the fruits of thu trip around the world were the "Voyage of a Naturaland "The Origin of Species."

It is not how rapidly a man travels, but what he sees, and the use he makes of his observations which give the true value. A study of the time tubles of railways and steamship lines would have given all the ratiways and ateamsing lines would have given all the information which the later of these two journeys bus thus far produced; while the consequences of that earlier and more deliberate voyage are continuing, in on ever-growing magnifude for the unlightenment of

### Harmsworth Trophy Retained by England

THE British motorboat "Maple Leaf IV," owned by I. E. Mackay Edgar and representing the Royal Motorboat trophy, known as the British International Motorboat trophy, known as the Marmaworth Cup, in a series of

races concluded on September 12th, over a course in Osborne Bay, 1ste of Wight. The "Maple Leaf" won two out of three races, and thus retained for Great Britain the trophy which she wen on Huntington Bay, ortion the (ropin) which she wen on functington (op), Loug behalf, hist vear. America was represented by the "Ankle Deep." She fullshed second. If, Holling-world's "Crimather," a British entry, was third. The curse measured 324 multied inlies. If was covered by the "Mayle Leaf" IV. In a funding and 10.25 sec-onds, by the "Aukle Deep" for Cambridge and 30-255 mids, and by the "Crimather" in 40 minutes and 30-255

#### The Motor Tank Ship "Hagen

THE trial trip of the new motor tank ship "Hogen" showed some interesting figures as regards fuel consumption. It will be remembered that this first birge mercantile motor vessel (2 evele motors) built at the Krupp Germiols yard at Klel is one of three vessels contracted by the German-American petroleum com-pmy. Two are sister ships of 8,350 tons dead weight capacity and 3,000 brake horse-power, while the third will have 15,000 tons capacity and 4,000 horse-power The "Hagen" is one of the smaller vessels, 100 feet lu length, 53 feet breadth and 32 feet 4 luches depth to upper deck, belog a twin-screw ship with two 6 cylinupper nees, neigh is twisterew stip win two reyni-der sets of englines of 1,500 horse-power each. The delivery trip-rounding life Skaw and in the North Sea-took place from March 15th to 10th, and mensur-ments showed the oll-consumption of the main engines at 1,050 brake horse-power (1,500 indicated horse-power) to be only 0.424 pounds fuel per brake horse-powerbour (0.297 pounds per indicated horse-power), including the fuel consumption of one of the n for injection all. In spite of liberal lubrication on this first sen stilp, not more than 13 pounds of inbrickling oil per hour were used for the whole engine plant, and on per nour were used not now whole engine paint, and in the future this will naturally be decreased. With 2,100 hrake horse power total, the ship attained 11 hones, and at 2,700 horse-power (3,800 indicated horse-power) it hereased to 12½ knots. As for as is known, every) Intereses to 1223 known. As far as a sanch, deepele martine engines of equal power barn 0.32 pounds per indicated horse power (the "Hugen," as above uses 0.297 pounds). Thus the drawback of increased con-sumption till now booked upon as uscolated with 2-cycle engines did not occur in the 'Hagen," and the great advantages of the 2-cycle engines over 4-cycle dld not have to be paid for in extra fuel,

### The E. H. Harriman Memorial Gold Medal

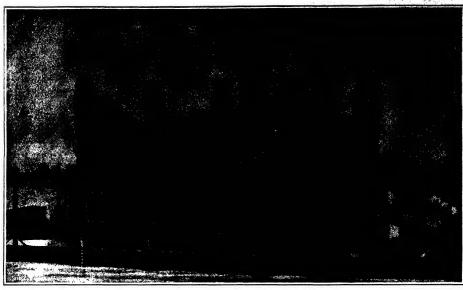
TO create a better understanding on the part of the public in what the ridironds are doing to make safer conditions of travel and to sufeguard their own personnel, through the prevention of accidents, Mrs. E. H. Harriman has offered a gold medal manually, to be awarded by the American Museum of Sufety

In amounting the gift, Mrs. Hutraman shites "To stimulate a direct effort for the conservation of human life, it gives me pleasure to place at your disposal the U 11 Harriman Memorial founded by me, to be awarded annually by your board to the American steam rullway making the best record in accident prevention and industrial hygiene affeeting the public and its own personnel thirting each curren

The gold medal will be awarded to the railroad com-pany liself, a replica in silver to the member of the operating department of that road who has done the most to ladig this condition about, and a replica in bronze to the employee of the winning road who was most conspicuous in the promotion of safety by sug gestions or otherwise

### The Current Supplement

A N important article in this week's issue of the Scientific American Supplement, entitled theters Patent in Relation to Modero Industrial Conditions," comes from the pen of F. B. Fish, one of the foremost putent lawyers in this country.—II. E. Ives and M Lucklesch have investigated the distribution of luminosity in nature. Their report appears in this week's SUPPLEMENT—MY T II Doubt contributes a handsomely illustrated article on the White Marble minuspacely instructed arrive on the wants auronal Temples of Illiwara, the exquisite carving of which equals anything that the western world can show—Some thue ugo Prof. Hole of the M. Wilson Solar Observatory Investigated the magnetic field of sumaposts. More recently be completed a similar study of the much weaker general magnetic field of the sun as a whole. This brilliant layestigation, in which use is made of the fact that a magnetic field produces certain iditeration in the lines of the spectrum, is of interest not only in its relation to the san but also on account of the light which it sheds on the probable cause of terrestrial magnetism -- Sir Officer Lodge's address is concluded in this issue, its closing paragraphs devoted to asvehical research and the question of the nevated to psychical resource and the question of the survival of the soul after death, a subject on which the great English physicist holds original views, as our readers know.



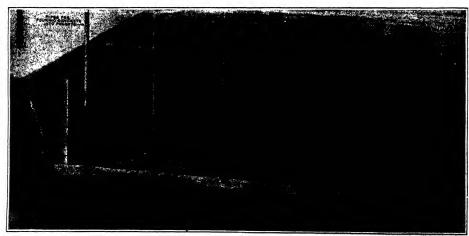
The "tremie scow" with which concrete is deposited on the tunnel.

IN the Science of March 20th, 1913, we total how the four-track tunnel of the Leatington Avenue subway was to be constructed under the Hardman River, and Hindersted the article with drawings and photographs of the Detroit Biver tunnel, which was built in a very similar manner. It was thought then that the work would soon be under way, but It was delayed owing to inability to obtain the steel for the tubes. Now that the actual laying of the tubes is in progress and one of the sections has been sunk, a degend of the interesting so term of tunnelling may not reduced to the contract of t

It will be recalled that the general method of procedure is to dredge a trench across the bed of the river, and in this lay the four lubes of the tunnel, afterward covering them with concrete and then fitting them also with a illing of concrete. The total length of the tunnel will be 1.0% feet, and it will be laid in five sections, four 220 feet long and one 200 feet One of the 228foot sections has now been laid, and is being concreted. The tubes as shown in the accompanying illustrations are flat at their contiguous sides and are connected by transverse plates or disphragms of quarter inch steel which hold the tubes in right relation to one another while they are being sunk, and also provide the necessary steel reinforcement for the concrete that is to be laid over them. The disphragms project well beyond the tubes, and join the timber adde walls that inclose each section. The disphragms are placed 15½ feet apart, and between them pockets are formed in which the concrete will be laid

To prepare a temporary foundation for the section just saik, bents, consisting of pairs of piles connected across the top with a head-piece of channel steel, were sunk in the truchi intendy dredged across the bed of the river. Each bent was carried down to the exact grade by menus of two pile drivers. Five heats were sunk at each end of the section They projected a fool or two above the bottom of the trench, and served merely as a temporary support. The material at the bottom of the trench is very closely packed gravel which forms an excellent foundation for the tunnel.

The four-tube section was assembled on a staging about a mile from the site of the tunnel. When the section had been completed, and it was ready to be sunk, a series of long narrow scous was introduced between the longitudinal rows of piling of which the stuging consisted. As the tide rose, the scows lifeting consisted. As the tide rose, the scows lifeting the section off the piling, and it was then towed out into stream. At one end of the tube section the ends of the tubes were closed by means of substantial bulk-hands which were closed by the control of the tunnel is being lined with concrete section only the two outer tubes were fitted with bulkheads, which were lighter because they were to be used only to prevent ton rapid



Laying a hed of concrete under the tunnel section before removing the buoyancy cylinders. Note that the mouths of the treatie pipes extend below the surface of the concrete laid.

socialize of the table. The finner two tubes were provided with partial bulkheade to beep out the water while the tunnel section was being towed to position. After the section had been floated off the pilling, the soows were suttled, leaving the tunnel section afost. The floating structure was then towed down to the size of the tunnel. It was decided to start sinking the sections at the middle of the river rather than at the shore onds. Balf of the river was encortingly blooked to navigation and piles were driven between which the tunnel section was guided and securately centred.

When the first section of the Petroit River tunnel was sunk it plunged endwise instead of settling down evently. Secured to the top of the tunnel were four buoyancy cylinders, two at each end, adapted to support the tunnel section after it had lost its buoyancy, but as there were no parti-

tions dividing the tub slight tilt was accentuated by a rush of water toward the toward end. To be sure it righted itself immediately after it had plunged far th to submerge the buoy-cylinders, but there was ancy cyli danger of straining the contion. To overcome any such tendency in the Harlem tunnels, the section wa provided near the heavier end with partial bulkheads tending halfway down from the upper part of two of the tubes. As the tubes filled with water, the heavier end tipped downward until the lower edge of the partial buikheads touched the water. Then the air trapped back of these bulkheads buoyed up that end until the tunnel sec The trapped air was allowed In escape through hose run-ning to one of the barges, where it was controlled so as to keep the section on an even keel When the tunnel section had been sunk to within about a foot of the top, it lost its buoyancy and sank abruptly until the buoyancy cylinders strapped across end came into contact with end came into contact with the water. These intoyancy cylinders were each provided with a central chamber into which water was admitted, until the tunnel section sank beneath the surface. derricks then took the strain. which amounted to about five tons altogether, and lowered the section slowly until rested upon the bents. The section was fitted with four masts, each bearing a target, so that by means of level and transit it could be brought into accurate alignment with the line of the tunnel. This was done with extreme accur acy, and the tunnel section, heavy as it is, is not more than 1/4 of an inch out of the true position

The method of laying the concrete under water was fully described in the laye of March 29. A large scow fitted with concrete mixing machinery is provided with five tow-

Market also all the to

ers so speced that when the scow is brought into position transversely ever the tunical section, "transies" may be lowered from them between and at each side of the funnel tubes. The tremise are provided at their upper ends with hospers adapted to receive liquid concrete. The first charge of concrete is relatively day and is adapted to force out the water in the pipes. Thereafter the concrete dropped into the pipes is quite liquid. The ends of the transies project below the surface of the concrete already deposited so that the latter will form a cover to exclude the water. As fresh concrete is added this cover will foat and protect the fresh concrete from the settion of the water. This system was employed in laying a concrete bed for the tunnel section after it was such that each of the disphragms would support its share of the load. The busyaner, cylinders were then revoved, and at the present writing the work of filling wavel, and at the present writing the work of filling wavel, and as the present writing the work of filling

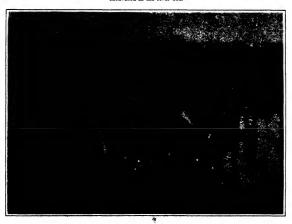
the peckets with concrete is nearing completion. When the next section of the tunnel is sunk, it will be connected to the present section by means of divers. When all are sections of the tunnel have been laid and concreted, builkands will be built around the ends of the tunnel and the water will be pumped out to permit of connecting them with the land section of the subwer We are indebted to Mr. Olaf Hoff, the inventor of

We are indebted to Mr. Olaf Hoff, the inventor of this system of tunnel construction, for the accompanying photographs.

### Bringing the Sea to Miraflores Locks

O<sup>N</sup> the morning of the last day of August, this year, the detonation of 38,000 pounds of 45 and 60 per cent dynamite opened a breach in a rock-and-earth

Towing the first section of the new Harlem subway tunnel to position over the trench previously excavated in the river bed.



The tunnel section filling with water and slowly sinking. Note the four masts bearing level and transit targets.

fill which had been made across the prism of the Panama cansi about a mile from Miratiores locks, and completed the eight miles of sea-level canal from Miratiores to the Pacific.

The duty of this dike was to exclude the water of the completed portion of the canal from the huge-execution in which the concrete masonry of the Minnestow took was being laid. The dike size rendered it possible, without having to wait for the completion of the locks, to complete the sex-level approach to the canal down to the full depth of 45 feet, by means of the excommical floating dredges. The dam was thrown across the canni prism some fore thousand feet to the south of the locks, and this stretch of a mile or so was executed in the dry by steam showels. The Mintafores locks are completed and the gates have been hung in position; so that there was nothing to prevent the

canai builders from permitting the Pacific Ocean to ebb and flow right up to the entrance gates at the seaward end of the locks.

In preparing for the blast, 541 three-inch holes were delibed vertically into the dam to an average depth of 30 feet, and the 18 tons of dynamite was distributed among them. The conditions at the time of and after the explosion are very lucibly described in the current issue of the Canal Record—a Government weekly publication issued under the editorship of Mr. Bucklin Blabop, which, during the building of the canal, has most admirably fuffilled its purpose of keeping the general public in touch with the progress of the construction of the great work.

At the time of the explosion, the water in the channel south of the barrier was nearly at low tide. The

dynamite tore a gap in the dike about 100 feet in width; but as the bottom of this rent as still at some height above the existing tide level, no water passed through At about half past one on the same day, however, the water in the sea-level channel had risen nearly to the top of the A man with a shovel dam. then opened a small treach ss the dike, through which a slight stream of water began to flow l'inder the cutting action of the water, the opening rapidly increase in size, until, some forty minutes later, a great torrent of water was poming through an opening 30 feet wide, with a fall of some 30 to 35 feet The rush of water, says the Record, ate uwn; the sides of the opening stendily, carrying large sections of the dike. including the trestle from which the dike had been built, together with other débris. into the excavated section of the canal between the dike and Miraflores locks The pit was filled rapidly, and at 3 o'clock, or one hour and twen-ty-five minutes after the first small strenm was opened by the workman's shovel, the level in the inside channel was the same as that of the outside commel, the gap meanwhile buying been opened to 400 feet of more

Two diredges are most at work on opposite sides of the dike removing wint is tell of It, and by October 1st 1 is expected that there ships will be able to steam up through the Paritie and of the canal for a distance of eight and one half milles to the locks As a matter of historic lates est, our readers may like to know that the hanner "this dean" was the first vessel to pass through this section of the canal made for isown steam, which it did on Theoday after noon, September 2nd.

Of our two illustrations, one shows the mass of débris in the air and failing into the water a few seconds after the explosion; the other, taken later, is a view tooking from the seaward end of the Miraffores locks and showing

the tidal waters of the Pacific tiling the approaches

The Annual Report of the Minissippi River Commission for the flacal year ending June 30th, 1912, published as an apenults to the report of the Chief of Engineers. United States Arms, as recedibly Interest to the Chief of the C

CONTRACTOR OF STREET, STATE OF STATE OF STREET, STATE OF STREET, STATE OF STREET, STATE OF STATE OF STREET, STATE OF STATE OF

### Handy Vise Tool By I. B. Spittel

Folls small work that cannot be hold in the vice halone the tool fluestrated in the accompaning drawing will be found very convenient. It consists of two pieces of cold rolled sixed,  $\lambda_0$  the barner by 4 inches long, connected at sectic end by serrows which are threaded into one of the pieces and shife freely in the other. They are also connected by strips secured there to with flathend servess. At one end the servers suffringle slots in the strap to permit of a limited amount of movement of the two pieces of steel toward and away from each other. The strap projects beyond the edges of the steel pieces, so that when the tool is pinced in the day, the predicting ends will rest an its just of the vice pieces, so that when the tool is placed in the day, the predicting ends will rest an its just of the vice in sistence of the vice pieces is a block of furnificial ends of framed with a toothed V groove to grly round surfaces readily for each of the connecting screws is a cell spring adapted to spread the members upart. The work may be temporarily held to the tool by declaring the blocks or faves on it and champling them to the therefore the tests and the vice just and be tightened to grly the work may scrutch.

### Oxidized Carbon Plate

By "Delta"

F is earlien plate, or preferably a number of carbon I plates arranged in sortes in a set of cells with lend cylinders for the negative terminals, and a mixture of one part sulphuric acid to eight parts of water for the electrolyte, be subjected to a current of ten or umperes, hydrogen gas will be given off conjonsly from the lend cylinders, while the oxygen that is generated will become absorbed and possibly partly combined with the curbon plate. It is best to arrange the cylinders of sheet lend with lenden hooks bent over the upper edge of the vessel, and supporting the cylinders so that there is a clearance of about an tach from the boltom of the cells. The cells should be tilled to within about un inch of the top with the dlinte sulphurle acid the curbon plates have been charged for about (went) minutes, they should be dipped into hel water to free them of any acid remaining, and then should be dried tipon an examination, it will be found that the colo earbou plate has become changed from the usual graphite color to a coffee brown all through that part that has been submitted to electrolyte action. If a test be made of the carbon in a bullery, it will be found that the cell is far more powerful in its action than with untreated carbon. The porous cup as well as the perovide of manganese and grammated earbon, which is used multily as a depolarizer, may now be dispensed with, and hence the internal resistance of cell will be lowered considerably. As the carbon surface has been roughened by the electrolytic action surrace has been roughened by the electrolytic uclina, not only be the negative surface hiereneed, but the tendency of the free hydrogen to cling to the surface is overcome, for the oxygen of the oxidized plate combines with the hydrogen to form water. Cells with curbon plates treated as described have been found of use for intermittent service as, for instance, in the intterles of electric cells and nickel-in-the-slot muchines, where the vigor of the cell is so improved that the number of cells in the battery may be reduced

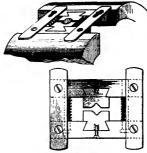
If n dozen carbone be treated in series as shown the Illustration, it will be found, upon disconnecting the carrent, the cells form a powerful storage latticey, enjudie of giving in considerable amount of energy in terms. This was discovered by the author when oxidizing a set of carbons for dry

### An Electrolytic Rectifier for the Garage

THE chemoed and simpled cherric lighting system for the automobile to day by the artificial form of the automobile to day by the straight battery system, in which a storage hattery is carried on the runting board or under the sent of the ear, and is connected to the head side, and tall lights lirrough switches on the dash

Such a battery, which is usually of 80 or 100 ampere-hour capacity, must be charged reguhirly from some source of power.

If the owner of such a system has a (10-voil ullernating curreal circuit in the garage, or has access to such a circuit, the following rectifier, which may be constructed for 'un expenditure

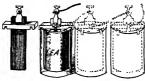


Tool for holding small work.

of a few dollars, will enable him to charge his lighting or ignition battery from such a source

or agricum enterly from such a source.

The first and most difficult part of the set to construct is the transformer. The core of this consists of a standard ten or twelve point off off No. 2B. W. G. soft from wire. This coil is first soaked thoroughly with shelles, care being taken to see that all binding wires or wires which run at right angles to the main canonicous of the coil are removed. This is to cut down eddy current loss. The coil is then phiesed in the over of a store and settle heat applied until the sheline is saked hard. The coil is then taped with three layers of half-inch pain cution take, wrapped spirally for about two littles the circumference of the coil. This twee is then while the late of the circumference of the coil. This twee is the relative of the circumference of the coil.



Arrangement of cells for oxidizing carbons.

Upon this laped ever the primary winding is now wound. This condusts of eight hundred turns of No. 22. B & S. double cotton covered wire, from two to two and a haif pounds being required. This should be put on in four layers of two hundred terms each. Each layer should receive a cost of sheline and a covering of one layer of the cotton lape. In winding the transformer, the trou wire core should be changed in an uprifult position on the edge of the work bench, so that the spool of wire may be passed through the center and over the outside without difficulty. Care should be taken when purchashing the wire for the transformer to see that the spool of whom the center of the row where coil. It

will be found that the ordinary these and deposits on a pool will do this without any disconsity. Ours showed be taken in the winding operation, to see their turns or wire its closely adjacent to each other on the inside of the coil and are speced apart on the outside in order to compensate for the difference between the interior and exterior disconsists of the own.

When the primary has been completed, the ends should be soldered to two short plees of finished and cord for terminals, and the whole wisding covered with three layers of the ection tape. The transformer at this stage should receive another cost of shellen and a second baking, care being taken to see that the ecoli does not become hot enough to burn the installation.

The secondary winding is now organized in these afferedly over the primary. The words of the property of the p

The next interest the country to be constructed in the rectifier itself. The parts meeded or it are as follows: rectifier itself. The parts meeded for its are as follows: Two enames were buckets of about two gallons caspedly each, four pieces of sheet true, five lucius wide by six inches long; two pieces of 1/16 inch atuminatum, three tuckes wide by seven inches long, and two pieces of hard wood strip about one quarter inch thick, one half inch wide, and two feet long. The true pistes should have holes drilled or punched in the upper corners of each pair, and the atuminum pieces should have a single hole drilled in the indidde of the top edge to receive a binding post or bross matchine levit and unit.

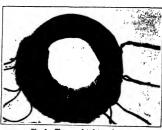
The two strips of wood are isld logether with the vo abundance plates between them, spaced about sixteen locks, center to center. An iron plate is then placed on the outside of such wooden strip, discussion propells an abundance and the strips to resister with the holes in the from plates, and the whole boiled longether with the from plates, and the whole boiled longether with larses unechine boils hiserted in these holes. This portion of the rectifier may be seen in Fig. 2, resiling across the tales of the two palls. This figure shows the complete rectifier in use charring a 10 sampershour lighting latter). Two pounds of soddium phosphate is placed in each

Two purposes of sodium phosphate is placed in each pail, and the pails are their filled with warm water. After this cools, the reclifier may be connected up as shown in Fig. 3. In the figure 4 is a double pole two ampere fuse block to which the 110-voit circuit is connected. B is the transformer, the two windings

being shown on different parts of the core for clearness. CC are the wo rectifying cells, and D is a double pole six ampere fune libeck to protect the lattery which is shown at E. The positive pole of the lattery should be connected to the middle tap of the secondary winding, and the negative pole should be connected to the rion electrodes of el to the iron electrodes of the rectifier. The outside terminals of the secondary lead to the two

It will be found that a rectifer constructed according to these directions will charge a state of about two to two and a hair amperes, while drawing about three quarters of an ampere from the fline. When the rectifer is not belug used, the plates should be lifted from the solution. The plates should also be cleaned frequently and the solution renewed every few months. The just of work renewal will be indicated by the heading of the solution. The shad of work renewal will be indicated by the heading of the solution. The shad of work renewal will be widely and the solution of the shadow of the shadow.

Water to the side of the same of the



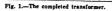




Fig. 2.—The rectifying outfit.

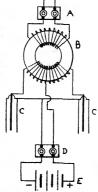


Fig. 3.—Electrical connections

Comprehensive to the second

### Fredericis Against Bank Note "Raining" and Forgeries

N ingenious device for imparting security to bank a noise and other security documents and means for detecting attempted forgeries, has been invented by Airred E. Hawtree, an English electro-chemical engineer.

Mr. Eswiree has used as a basis for his invention the well-known principle of the sound waves of the phonograph record. For instance, he manufactures the paper upon which a bank note is to be printed with

one or more edges of tregular, but predetermined form, such form corresponding to certain sound waves. For a strepound note the edges record the spaces words "fire peutids," and when piaced in the reproducer the note piainipsed in the reproducer the note piainly smootness its rightful denomination. It have been been been assumed to be almost absolute protection against "rainbank notes or checks, since a noteration in the proposed of the piace and the proposed of the proposed of the piace and the piace of the piace and the piace an

The method of preparing the bank invested upon gians, by a stylus which sired upon gians, by a stylus which is connected to a diaphragm, the sixter being caused to vibrate with the desired sounds. An enlarged photoarspinic cupy of this line is next made, and by hand or by a photo-mechanical process a thic template is cut of the

same emisrged form. This template guides a tool which curs out the same form to the required scale in the form of a steel cutting knife. This knife is employed for giving the edge of the paper the required outline.

The device for use in reproducing the sounds thus recorded by the paper's adon. M. Bastrose describes as a pair of vertical cylinders rolling against each other and operated by a suitable driving power to rotate and operated by a suitable driving power to rotate and operated by a suitable driving power to rotate and operated by a suitable driving power to rotate and operated by a suitable driving power to rotate and operated by a suitable driving a hole in it under the line atomy which the cylinders to consult has, similar to some form of these in general use upon talking machines, is placed beneath the parent above described, and a suitably shapled stylin projects upward through the hole mentioned. The document to be tested should be held vertically with the sign under samination resting on the plane. It should be advanced until the rotating cylinders engage fix vertical edge. They should then draw it between them, the roughened lower edge passing across the stylins which projects upward through the hole in the plane. This would cause the stylins to actuate its sattached reproducing parts, when the nature of the sounds entitled owned determine the symultonesses of the document.

The wide possibilities of this device may be readily insighted. A bank employs a clerk whose sole duty might consist of running bank notes through the phonograph, and any of them which did not renty truthfully to their denominations would be repurred an counterfeit. Or timid and suspictous private individuals could install in their homes or offices a machine which would advise them above a vestige of doubt whether their cash in land was genuine or superious. In the filtustration, Fig. 1 shows a general view of

In the fillustration, Fig. 1 shows a general view of the device and Fig. 2 a section of the reproducing end with the horn and part of the strip B removed. Two strips of metal AB are separated by a thin and narrow strip U atong one of the edges, thus forming a deep and narrow channel. A short fire still D is cut in one strip A at right angles to the separating strip U and with one

and just resetching it. A round hole is to entire in the other strip is exactly opposite the line still bit in the first strip B, a Merchine in the other strip B, a Merchine strip B, and the strip strip B, and the strip st

Forest officers have found that high lower telescopes are not always estimate. Copy in Ser-looloust work. In some touthties heart vibrations in the atmosphere are we insention by the game that cleaves the control of the con-

### Improving the Reproduction of Talkingmachine Records

A SIMPLE clarifying, articulating and amplifying sittenthment for talking machines was discovered by the accidental touching of a fine needle with the finger while a record was being played. The inventor, M. B. Claussen, about two years ago, while teelting out assurecords, happened to touch the needle and noticed that it vibrated. He was using a very fine straight-wided needle, which produced a low sweet tous, but lucked



A SANCE OF

Fig. 1.—General view of bank note security device. Fig. 2.—A section of the reproducing end with horn and part of strip B removed.

A combination measure and funnel with automatic shut-off, designed or the automobile owner or the garage man.

the power lo propel the sound from the horn. This finneedle was free from scratch, and while it did not produce the volume of the heavy beadle, it had none of the heavy needle's mechanical tones. Mr. Clausen argued that if he could add power to the vitiration of this dise needle, it would reproduce all there was in the record with a volume equal to that of a heavy needle without any of the heavy needle's defects, such as excratch and aftertones. Besides, the great wear on the record caused by the heavy needle would be avoided. After trying many devices to increase these



A device which clarifies and amplifies the reproduction of talking machine records.

Muratum, in found that a disk of a certain diameter, hickness and dendity strached to the needle near its point, not only increased the volume of the fine needle considerably, but retained all the purity of the fine needle, and, at the same time, by its vitractory action eliminated the aftertones and caused each word and note to be reproduced clearly and distinctly. Some indistinct records even became andible. Tones never heard before were brought furth. The sound was lifted clear of the machine. The slager or mustein was in the rown, not in the box. It reproduced at the artist



One-ton truck crane with compensating quadrant.

put into the record in the nerbal's natural voice, or with the musician's artistic touch. In the present form the device consists of a disk, two springs and an mostiled metal band. The band is slipped over the circumference of the sound box, and the disk over the point of a fine needle. The springs hold the disk in parts.

Tests, made under a microscope, of records played one thousand times with the device showed no perceptible wear. The long point of the the needle instructed all parts of the record, but had not broken down the well. Further experiments showed that by slightly

hereasing the length of a flue, stratight sided needle, the vibrations were increasest and the reproduction brought to a point of perfection. The device is made to fit this needle, and with it produces the best results

### An Automatic Shut-off Measure

A COMBINATION measure and lunnel, designed primarily for the automobile awner or the garage man, but neefful ulso in many other ways, bus been placed upon the market

As shown in the accompany in tiline and funcing the form of the fo

the or other vessel and, by means of the bull-valve, the flow can be stopped instrutioneously by releasing the pressure on the thumb plate on the upper end of the valve red. The valve is held lightly on his sent by means of a spring.

With this measure, a tank or other receptacle may be filled to any desired height and sinn of without danger of overflowing. On pitching the measure in an upright position after the filling, any liquid remaining in the framed will run back but the measure without dripping on the outside.

### Edison Uses His Old Telegraph Instrument Again

AT the meeting of the old-time Telegrophers' Illatorical Association of the United States at Mounit Clemens, Michigan, on August 28th, Thomas A Eillson sent a message over the wire to President Wilson. The occasion was of special interest, because Mr Eillson stood upon the same site where he stood when he sent its first message as a telegraph operator, and used the same instrument he used lifty-one years ago when, as a boy of fourteen, he sent his first message over the lines of the Grand Trank tallway.

Back In the pre-telegraphic days, when Edison wan only a newspaper boy on the Grand Trank Rathway, he showed his youthful enterprise by printing and selling a small newspaper containing the news along libe route The kept a little font of type in the baggang-sur and quinted the paper on the train, so its leans were strictly into the minute. It was during this period that in Indiaman lifted labu lot the ears, later causing the deafness that now blank bis hearts.

### A New Compensating Quadrant Crane

In an accompanying illustration is shown a new holstting crane, the invention of Cupt. A. P. Landin and Axel Wella, two matthe engineers. Although this crane was first announced about a year ugo, it was not mill

recently that it come into general industrial ness, being maniferrierd in severed different models. The type shown is a one-ton crane with a compensating quadrant fastened at the lower cut of the jib which can be instead of lowered. The quadrant is provided with teeth that engage in a rack and roll in a slot in the horton plate. An actualing series works in heartings in the top ferme. This actuating series whigh the quadrant by mems of a not which slides on a guide at the top of the frame. The bottom plate is provided with four tollers for slewing and each model is so constructed that it will oper attentionals a complete circle. In the settlement, and the supposition of course, the pointed in any direction by montpulating the tracks on which it is mounted.

The compensating quadrant has two functions, the more important being to give the load a hortzontal travel. With a multiple speed, obtained by means of an electric motor and gears, many sized loadcan be adjusted without changing gears

### The Motor-driven Commercial Vehicle

This department is devoted to the interests of present and prospective owners of motor trucks and deliver any quasitions relating to mechanical features, operation and management of com-

#### A Vehicle Movement Recording Device

A LTHOUGH transportation by motor vehicles has become largely a science thanks to the efforts of efficiency engi neers and others, and routes once covered in a haphazard manner at the discretion of the driver now are plotted and covered according to the well thought out plans of some one who has supervision and who can best visualize the system with a view to promoting its efficiency, the fact re-mains that drivers still are out of sight of, and consequently out of the influence of, their squeriors or whoever may have the good of the service in charge, for a considerable part of their time. That most drivers maintain their schedules un der such circumstances-when the watch-ful eye of the "boss" is abscul-is a tribute to the honesty of the fraternity, though it by no means obscures the fact that other drivers, less houest, do not

scruple to loaf when the occasion presents itself.
It is to check the performulice of these drivers and their vehicles that the justrument shown by accompanying filustration has but recently been brought out. Need-iess to add, the instrument performs valuable service, too, when applied to the vehicles driv men who are known to be perfectly honest with their employers and who adhere rigidly to their

Briefly, the instrument records the thne a hicle has been in motion. the number and duration of the stops made, the uileage iraveled and the speed of the vehicle at any moment it is under way. Despite the multi plicity of its functions however, it is not as complicated us the result achieved would seem to indicate

indicate

The record, which is made apon a tape about twice the essent for accuracy, though it may be ap- has so convincingly an extract the common stated. At the profitably to and frowing the produced in part by clockwork, and in part by clockwork, and in part by the movement of the vehicle to which it is attached. The laws extract the profitable profitable that the determining speeds continuingly and the part by the movement of the vehicle to which it is attached. The laws extract the average return, in freight charges, of ½ from a distant point provided that by so be produced in part by clockwork, and easy method of determining speeds court jer too jer mile, the earnings per doing prompt and effective accommodations of the vehicle to which it is attached. The laws the provided provided that by so the part of the vehicle to which it is attached. The tabe is an essential part of the device, of course, and therefore should receive con-sideration first. Its length is sufficient to permit the recording of 36 hours' service It is ruled lengthwise and also transverse-The width of the tape represents a distance traveled of two miles, the sub divisions representing one quarter mile The vertical lines on the tape are the time lines and they represent 15-miu-ute intervals. The tape is wound up on the large dram at the rate of one com plete revolution of the drum every six hours by clockwork. Pressing against the tape there is a tiny pencil or styles which is moved across the width of the tape by can mechanism operated through the ediary of a flexible shaft from one of the front wheels of the vehicle

When the vehicle is stationary, the pencil does not move, but us the tapo is wound up on the drum a straight line corresponding in length to the duration of the stop in minutes, is traced. Immediately the vehicle is set in motion, how ever, the stylus commences its travel back and forth across the tape, and as the ity of the record lines which permits quick and accurate readings of speed to be made. It is possible, of course, to di vide the mileage as indicated by the trave of the penell across the tape into the the made and onick work is essential a de vice similar to that shown by one of the

In use, the record tape is placed be neath the transparent portion of the device, as shown by the picture, and when any of the record lines is placed directly beneath the hair-line, the speed of the vehicle for that moment is indicated by duced to an effective average of but the pointer on the scale. Practice is nec-

interval, and in this way to compute the speed, but where many computations are Illustrations is used; it is a convenience that has been developed for the quick reading of many tapes such as would come from the instruments on a fleet of ve hieles, though it is not absolutely neces sary and may be dispensed with as ex-plained above.

Examining the "log" of the truck.

hicle some hours after the occurrence of an accident will serve to make plain its undoubted advantage. Witnesses of the accident in question—it is a matter of court record—declared that a heavy commercial vehicle which killed a young lad in rounding a corner, was traveling in excess of 20 miles an hour and one went se far as to state the speed was nearer to 30 miles an hour. Examination of the record tape, however, served to demon strate beyond cavil that at no time during the previous 12 hours had the speed of the vehicle exceeded 12 miles an hour, and that at the time of the accident it

In another illustration there is shown the method of removing the record tanethe instruments after each day's from the instruments after each day's to be desired, yet, when investigation work is complete. As the operator works shows that an average of three hours per outly at night and as the illumination of garages is not always as brilliant acould mixed, the motor truck becomes unprofibe desired, he carries a miner's imm af-is able for relirond service. Their added fixed to his cap and operated by a small capacity and increased speed are storage battery hooked to the back of discounted by aget fidel times. As the has been of the truck that are attacked in the capacity of the storage batter to be a some fixed to the contract of the capacity of the capac movement of the tape is constant, the line a beam of light upon the tape and exam-traced by the stylin is at an angle to the ine readily the "log" of the truck.

was traveling at the rate of 4 miles an

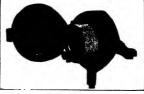
### Terminal

THE RESERVE OF THE PROPERTY OF

By Robert L. Niles

WHEN it is reflected that no railroad, steamship line, canal, towboat service, trolley line, or ateamboat, as to the freight carried, begins at the beginning or ends at the end, that is to say, that d thus transported has had to very pour be collected, and will have to be ultimate be collected, and will have to be ultimate-ity distributed, by some other method, by horse haulage or manual labor, the vol-ume of such collection and distribution and the importance of the problem bee most impressive

The most serious difficulty the rallros are called upon to solve is the question of terminal facilities. The freight car, which, once upon its journey, may readily cover some 250 miles per day, is, at present, by the congestion of terminals, re



The recording drum



Device for measuring angles on the tape.

\$31.25 per day to an actual \$2.50 per day
—a figure at which profitable operation becomes well uigh impossible. The anomaly is presented that the larger a city s profitable its freight tonnage in proportion.

The manifest solution for such conditions is, if possible, au enlargement of terminal facilities Cortailment of earning power to the railroad is not the only result of congested terminals, it involve heavy additional and unnecessary expense to each individual shipper, and to all stevedores and teamsters, and proves greatest obstacle to the employment of otor trucks in the collection and distri bution of railroad freight.

From the standpoint of the general pub-lic, its health and convenience, the elim inution of horse-drawn vehicles is greatly to be desired, yet, when investigation pers runs as high as 50 cents to \$1 a ton any fraction of the total thus rempred, and over per mile, or to one hundred to from the congested zone would in every

vertical time lines, and it is this angular | The Motor Truck and the Freight | two hundred times as much as the mile age charge of the railroad, so that, save for distant points, the haulage charge in greater than the railroad charge. To refired, short hauls in the consested dis-

> In the interests of both the railroads and the shippers it is evident that some plan should be sought by which these de-4 inys may be avoided or diminished. expressed heretofore, the natural solut would be the expansion of present task age and platform space, as well as age ann piatrorm space, as well as the approaches thereto, yet extensions of present sites would involve staggering expense, and an increase therefore of capitalization difficult, if not impossible, to

There remains, therefore, the alternative of the establishment at other and dif-ferent localities, of supplemental receiv-ing and delivery stations, where such needed trackage and space either at pres-

ent exists or may be cheaply acquired.

Such a solution, how ever, would necessitate much longer ladividual haulage, which in the case of horse-drawn vehicles would seriously de tract from the advantages of the prompt ser-vice thereby secured. It is here that the motor truck appears to its best advantage. With its in-creased speed and carrying capacity, and ability for continuous, threiess service, regardless of length of time in operation, a comparatively "long haul" becomes less ensome than a comparatively short "wait." With horse equipment a "wait" of an hour is preferable to an additional length of haul of % of a mile. With a motor truck an extra haul of four miles is less expen-sive than a "wait" of one With motor equiphour.

they can succ safully haul trailers: to wit, inexpensive carrying bodies without expensive motor equipment. Such trailloaded, at leisure, and ultimately picked up and dispatched by the motor unit, itself either a load carrier or simply a notor, as conditions warrant

It would appear therefore that through the establishment of such "annex" freight terminals, confined, it well might be, to certain classes of freight, or certain ex-tensive shippers, the congestion of the terminals at present existing would be materially reduced, and it seems not too sanguine to imagine entirely removed, thereby expediting not only such tonnage as was therein handled, but that still distributed from original depots. Such service might well do for the various rail-roads what the New York Clearing House has done for its associated members, and expedite and inbricate the whole problem of freight handling. Manifestly it would not be necessary for such a system to at-tempt to handle even a substantial part

of the whole tennage.

Any fraction of the total thus removed

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sing proportion reduce such c gestion; for in the handling of freight as in handling passengers, a small percentage diverted, restores uninterrupted flor

### "Toppings" for Motor Fuel

TO test out a new kind of carbureter a motor truck recently made a trip from Los Angeles to San Francisco, using as fuel oil "toppings." The distance covered was 472 miles and about 461/2 galions of fuel were used, giving an average of over ten miles to the gallon. The car was of 1,500 pounds capacity, and was loaded with over 2,000 nounds. The entire bill for fuel amounted to \$1.40, and in addition to this 3% gallons of inbrient-UNN & COMPANY that portion of the refinings which that on the top of the tank and have hereto-fore been considered practically a waste product. The specific gravity is only 41 legrees at a temperature of 85 deg. Fahr., and the cost 3 cents per gallon. The following is a table of fuels, giving their spe cific gravitles and the cost per gallon at

	Gravity.	Cost
Fuel. Ban	mé 60° F.	per gal.
Oil toppings	88.5	.03
Kerosche	42.7	.00
Distillate, 1/4 kerosene	476	.08
Distillate	51.4	.07
Gasoline, ¼ distillate	55,3	.11
Chamilton	50 T	1414

### **Motor Truck Queries**

M. O. L. writes: "In my grocery delivers wagons for regular deliveries and a 2-ton truck for hauling my goods from the rallroad to the store not some light vehicle which I can use for 'special deliveries' to give prompt service to customers after the regular de-

Hivery has been made?"

A. It is not to be expected that a delivery wagon used under these conditions would be run at nearly full load. In fact. nine times out of ten you would probably not have occasion to carry more than one lundred nounds—and much less than this in many instances. These are conditions under which a motor truck cannot be made to show a maximum return on its investment, but us a convenience to patrons and an advertisement, it would soon prove its value. What you need is a speedy, 500-pound vehicle that is easily handled and that can travel 35 or 40 mile on a gallon of gasoline There will not then be such a discrepancy b rated capacity and the normal loads it will be called upon to carry, and the co per delivery will thus be kept down. It would seem that a three-wheeled "motor-cycle track" would well answer your re-quirements. Such a vehicle can be ob-tained at prices in the neighborhood of tained at prices in the neignormous 48400, and can carry londs of 600 pounds and over. The regular motorcycle with sidecar delivery van can be bought for about \$330. This has a capacity of 400 pounds and, like the one mentioned above. ls no more difficult or expensive to operate than is a motorcycle.

J. H. O. writes "I have a large barn which I wish to convert into a garage for my delivery tracks, now stored in a public establishment I have alternating electric current in this barn, and would like to know if there is any manner in which I can convert this into the direct current for charging electric vehicles.

A. You will need what is known as a "rectifier." These are made in several different sizes and styles, and it will be necessary for us to know the voltage and number of cycles of your alternating cur-rent, and the number of batteries you will need to charge, together with their charging rate. The smallest instrument suitable for charging a single electric com-mercial vehicle at 30 amperes costs in the mercial venicle at 30 amperes costs in true neighborhood of \$200. Of course this rec-tifier can be used for an indefinite length of time, and thus several vehicles may be charged in succession. To charge more than use set of cells at, a time, however, you will need a larger outpt.



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### GENERAL VEHICLE COMPANY. INC. General Office and Factory Long Island City, N. Y.



Va. writes: "We operate five 8-he Va. writes: "We operate aw 3-horse trucks in our coal basiness, but want to motorize our delivery equipment as soon as possible. These heavy trucks represent a considerable investment, however, and as some are provided with modern elevating bodies, and others with the latest type of side chuics, we are naxions to know if these can be mounted on a motor reacher frame—and thus save a portion of and thus save a portion of truck fram the cost of the installation."

A. Not only will 3 on he able to use the original truck bodies, but the rear wheels power, you will not need to "scrap" any of your old truck equipment except the front wheels. When these are removed, the front of the truck is placed on the "fifth wheel" provided for the purpose on the rear of the platform of the tractor, and the old body and rear wheels thus serve as a trailer. By the use of such a tractor, the capacity of the original bodies is at least doubled, inasmuch as twice the number of trips can be made, or the same number of deliveries can be carried a greater distance. By means of the prope rigging, the bodies may be easily reor set in place on the tractor, and thus one body may be loaded while the other is being run to its destination. The operation of a tractor and trailer is not difficuit, even in congested traffic, although of course the vehicles could be run only a short distance on the reverse

B. E. M. asks. "Why is the fixed spark' used to a greater extent on trucks than on pleasure cars? What are its advantages?

We do not know for certain that the fixed spark is used to a greater exten mercial trucks than on pleasur There was a time when the fixed spark was popular with taxical man turers, but while these machines are list ed under the head of commercial vehicles they could hardly be classed as trucks The fixed spark has been applied to some pleasure cars in the effort to simplify the control of the vehicle, and it is this same desire on the part of manufacturers that, at certain times, has made it seem a popu iar design on trucks. The fixed sp renders a motor car more nearly "fool renders a motor car more nearly "root proof," but does not allow of that regula-tion of ignition that is necessary for effi-cient running at all speeds. On the as-sumption that the motor truck driver either is not as intelligent or will not exercise the same care as the owner of a pleasure car, some truck manufacturer ve set the spark to occur at the of the compression stroke and have the eliminated ail means for changing it This is the position which is not liable to produce a back-kick at the starting crank, and yet one which gives good results at ordinary speeds of the engine At high engine speeds, it is advisable to set the spark to occur before the upper dead center of the compression stroke is reached. Improper regulation of the spark, however, may be more harmful than a constant position, and the personal equation is therefore the determining factor as to the advisability of the set or variable spark.

A. I. P. asks: "Why are not more self starters to be found on motor trucks?"

A. The motor truck is a business nece sity, not a iuxnry, and every cent spen on it must show its proper return Furthermore, the number of pleasure carin use at present far exceeds the trucks and designers have therefore turned their attention to applying the starters to what would seem to be the more profitable field. The automatic starter is still a new-conser to the automobile field, and has not been in use on the majority of cars more than in use on the majority of cars more than two years. The time is not far distant, however, when the trucks will be provided with this "inxury," and owners will find that it will pay for itself in a short time. The driver of a truck provided with an automatic starts will be more with an automatic starts will be more liable to stop his sagine such time the vehicle is brought to a hat, say the gains line avent in one year will be coordinately.



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# Notes and Queries.

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(12857) T. J. T. aaks: I beg to inquire of you if there is such an instrument made to locate iron or such the foot or more under the locate iron or such the foot of the more underground by the use of a dispitag needle. This appears has a magnetic needle hung so take it swings in a vertical plane instead of retrigates in a horizontal such and plan plane for the production of the productio

In the ground. A sonative dip media might indicate their presence at a distance even greater as an order of the presence of a distance that the presence of the second of the presence of the second of the presence of the pr

(12569) H. A. asks: In my high school geometry class I was told that a prach and born offered for a geometrically proved method of trescribing any angle. I have bened that it was offered by some Stundard college or institution. An extra college of the state of the

(12890) D. G. asker. I would like to know how to magnetice a magnetic that has been demangated? I am in possession of a "Wagner would be magnetic With this same reculifier or not, and also how to proceed. A. You can remagnetize a magnetic with this same reculifier or not, and also how to proceed. A. You can remagnetize a magnetic with the wine with you when the magnetic will be work wagner. With care would be made to the magnetic with the work of the wo

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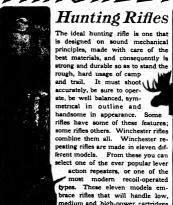
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# THE TAINTH TRAR DESCRIPTION OF THE PROPERTY OF

#### THE WEEKLY JOURNAL OF PRACTICAL INFORMATION

NEW YORK, OCTOBER 4, 1913. 15 CENTS A COPY

spinesment, 80,600 tons. Mores-power, 40,000. Speed, 22.5 knots. Armer: Beit, 12-inch; upper beit, 9-inch to 6-inch; turrets, 12-inch; 6-inch, sixtesy 4-inch. Tárpado tubes, two 21-inch. Minstanum fact especity, coal, 4,000 tons; oli, 600 tons. Complement, 1,050 men. The 27,400-ten Argentine dreadnought "Rivadavia" making 22.50 knots on her trials.

# The New Argentine Dreadnought "Rivadavia"

The First Dreadnought to be Built in American Yards for a Foreign Power

THERE is a decided prestige attaching to records for high speed which renders the recent speed trials of the "Biradavia" very gratifying to the builders and ewpers of that ship. The "Biradavia" and her sister the "Moreno" are two dreadnoughts of the largest size and power, for which, a few years ago, the Argentine government solicited bids from the leading shipyards of the world. There was very spirited competition to at the word. There was very spirited competition to secure this contract, and it was a mather of great satis-faction when an American company, the Fore River Ship and Engine Fuilding Company of Quincy, Mass., secured the contract for both ships at a price of \$22-00,000. One of these, the "Rivadavia," was laid down at Quincy; the other was sublet to the New York Ship-building Company Canden, New Jersey.

at Quincy; the other was sublet to the New York Ship-building Company, Camden, New Jersey.

The "Rivedavia" underwent her high speed trials on September 10th, when she alightly accessed her con-tract requirement of 225 knots an hour, the displace-ment of the ship at the time being 27,000 toos, and the average hore-power developed being 40,000. The "Rivedavia" is thus the funites testleship to built in America. Of the dreadpoughts built for our Navy, the "Delaware" made 21,500 knots; the "Utah," 21,01 knots; the "Morth Deloton," 23,01 knots; and the "New York" and the "Tenad" made 21,500 knots. and the "Texas" made 21 knots.

and the "Texas" made 21 knots.

As will be seen from our litustration, the "Rivadavia" differe considerably in her outboard public from the situs of the United States Navy. She has only one lattice man carrying a Street outboard public from the situs of the United States Navy. She has only one lattice man carrying a Street outboard on the output of the older type. The bolise rooms are speed wide spars, the foreward shubbeards he had present the spars, the foreward shubbeards he had been should be shared the state that the sta

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guns superposed above the forward turret, and amidships, between the smokestacks, are two more turrets placed as cohelos, and so arranged that the four guns of these turrets can be fired dead ahead, dead astern, or over a restricted are on either beam. The other two currets are placed astern of the mainmasst, one at the after end of the superstructure, and the other on the quarter deck. This arrangement provides for a fire dead sheed or dead satern of eight guns, while the whole battery of twelve guns may be fired on each

broadence.

The armor distribution is as follows: The main belt, 12 inches in thickness, extends for 250 feet amidships; it tapers from that thickness to 5 inches at the bow and 4 inches at the stern. This belt is 9% feet wide and 5 feet of it extends below the mean waterline. Above this belt is a secondary belt which varies from 9 inches in thickness at its junction with the main boit to 6 inches abreast of the 6-inch gun battery. This battery is located between number gun sactery. The battery is located between number is and number 5 turrets, there being six guns on each broadside. It should be mentioned that the "Rivadavia" carries also sixteen édoch guns.

Special attention has been paid to the protection of

the ship against underwater damage. She the any against underwater cannage. She carries tor-pedo net, and, as an internal protection against tor-pedoes, she is provided with a 2-inch interior wall of special steel, and also a 1½-inch deck which is worked auddehips over the double bottom. The ship has a cruising radius of 7,000 miles at 18 knots and 11,000 miles at 11 knots-certainly a most axce

#### Garron' Flight Across the Mediterranean

On September 23rd Robins G. Gerros, the function of Nagatime 23rd Robins G. Gerros, the function of Franch aviator, make what may well be regarded as the most perfused over sea serial voyage in an aeroplane thus fur achieved. He sew across the Meditermean Sea from San Raphes, France, to Biserta, Tunia, a distance of 500 finites. This is the longest over-water fifth ever missed in an aeroplane. The distance was covered to seem flower and fifty-three ministes at the returning seasof of 61-65 miles and hour.

Thus to not the diest that Gaires has crossed the

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Mediterraneau. In 1912 he crossed that Sea between Tunis and Sicily—a distance of only 100 miles. That performance was much applauded at the time. His new achievement is all the more remarkable because he did not accept the use of torpedo boats to pick him up in case of an accident.

#### Artificial Ment

A COORDING to the Paris daily journals a Belgian scientist, M. Effront, has succeeded in producing artificial meat, and this is another advance made modern chemistry, after the synthesis of regetable extracts or perfumes and even the albumens which are the base of living substance. M. Effront now uses a remarkable process for industrial preparation of nitrogenous foods at a very low price, and these are said to resemble ordinary meat in a striking degree. He uses different residues of manufactures which are almost worthless, such as brewery or distillery refuse products, and from these he extracts a food albumen The refuse material is first washed, then pressed and treated by sulphuric acid and afterward by lime, being then put through other operations which are too long to enumerate, ending by filtering and evaporating in tacso. The result is a pastry extract which has a very pronounced taste of mest and has three times the food. value of the latter, owing to its concentrated state. els several doctors have already me de experiments upon nutrition of the human body, and the results are upon nutrition of the numan body, and the results are quite conclusive. The same chemist produces a like food by the use of fodder, such as hay or clover as the raw material, and this product has a similar nutritive value as has been proved by various tests. Such researches are as yet far from the absolute synthesis which Berthelot predicted, but economists already forsee that the practical use of these nitrogenous products can't me practical use of these nitrogenous products may so far to counteract the continuant rise in priese of food at the present time. Perhaps the day is not distant when science will be able to produce from the mineral world not only foods of animal origin, but these which come from the vegetable kingdom. We expect to give a more detailed account of the process.

#### SCIENTIFIC AMERICAN

NEW YORK, SATURDAY, OCTOBER 4, 1913

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#### Munn & Co., Inc., 361 Broadway, New York

The Editor is always glad to receive for examin articles on subjects of timely interest. If the photo the articles sharr, and the facts suthants, the or receive special attention. Accepted articles will regular space rates

The purpose of this journal is to record accurately nply, and interestingly, the world's progress in soi tific knowledge and industrial achievement,

E direct attention to the letter from a mober of the Institute of Chair ber of the Institute of Civil Engineers of Great Britain which is published in the correspondence columns of this issue. The writer takes objection to our recent editorial on "Sea-level Canal and it is evident that he represents the school of English and Continental engineers which believes, or did believe, that whatever might have been its great cost and the added number of years necessary for its completion, a sea-level canal would have been the only satisfactory solution of the problem

the only satisfactory solution of the problem Speaking broadly and as the result of a close per-sonal inspection of conditions during a visit to the canal, we do not hesitate to say that the persistence of foreign engineers in their belief that a sea-level canal is possible at Pansma, is due entirely to lack of inforation, or of appreciation of the actual conditions at the Isthmus. Engineers should besitate to make broad ralizations regarding huge physical underta such as this; for they of all men have reason to know that controlling local conditions may render such gen-eralizations worthless—If our correspondent had stood with the writer at the bottom of the Culebra cut and seen some sixty acres of the mountain sliding into the cut on one side, and seventy acres on the opposite side, at the point of deepest excavation, he would have realized at once that here was a problem requiring separate consideration—one to which broad generalizations should never be applied.

We are still of the opinion that the tidal flow in a neer-level canal would induce an objectionable current; and we cannot understand how the large volume of the Gatun Lake has a hearing upon a question of locks or no locks; since the creation of a high-level lake neces-sarily implies the construction of locks to render it

Regarding the question of earthquakes and their effect upon the canal structures, in the near future we publish an article by the geologist of the Isthmian Canal Commission which most effectually removes any grounds for anxiety as to the permanence of the canal

That the 1,000-foot locks will prove too small for vessels that will seek to pass through the canal, we do not believe We are firmly of the opinion that the demand for greater locks will not come within the "lifetime of the youngest child that can read the Scientific AMERICAN " The 900-foot ships of to-day are built of that great length to meet special passenger require-ments, which are to be found only on the transatiantic But if the day should come wh travel between the two oceans warrants the construction of ships of from one thousand to fifteen hundred feet in length, "M. I C E." if he has any knowledge of topography of the Isthmus, must know that it is not beyond the resources of engineering to construct in the low foothills adjacent to the existing locks, of locks of larger size, and to construct them in t dry, and so protected by dikes at either end of the excavation, that they can be thrown into service without one hour's interference with canal traffic.

The "decree of Nature" that there shall be no sea-level canal at Panama is clearly written in the unstable charactersfor the materials through which the tion of the engineers tell the story of the problem at Culebra in most convicing fashion. On July 1st, 1912, the estimate of the total excess: of excevation for the completed canal was 212,227,000 cubic yards. Eight completed canal was 212,227,000 enthe yards. High-months later, in February, 1913, the settimate had gone up to 214,184,000, an increase of £,521,000 enthe yards; and four months later, on 719 14z, 1913, there was a further increase of over 14,225,000 cuble yards, the total increase during the year being over 20,000,000 cuble yards, and of this about 2,000,000 yards was due to siddes and break in the Culebrar cut. We invite attention to the fact that this increase of 8,000,000 cuble yards was due to a few face lowering of the excavation in the cut to finish it down to grade, 86 feet show the bottom of a sealway again! We have

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S. G. A. H. G. C.

feet above the bottom of a sea-level canal. W

85 feet above the bottom of a sea-level curst. We save the our correspondent's imagination to forpetell what the increase due to slides alone would be if the cur-wers curried down eighth-wife feet farther. And let it not be forgotten that the angle of repose —the slope—electratined by Nature, is one-to seven. What a further vertical execution of 85 feet would. add to the excavation totals on such a slope nobody can understand better than M. I. C. E. himself. Furthersore, it is very doubtful if admission of water to the move, it is very according a consistent or water to the prisons would help to preserve equilibrium. As a mat-ter of fact, the resulting antenedies of the toe of the slopes would rather trad to present farther movement. We are still of the option that the these of coustruc-tion and the total ultimate cost of a canal at eas level

tion and the total ultimate cost of a onsal at ean level would possibly be double that of the present small. Already, without adding one fact to the preposed depth of the esseration, the total pratings is about one third present than that of the original estimate. True, seem of this is due to an enlarge-small critical reason of the present of the canal dimensions; but the bulk of it is due to silder. A cut 185 feet deeper throughout, would destroy the A cut 85 feet deeper throughout, would destroy the equilibrium in meny miles of the route where at pres-ent no excavation has been made. If we add to the cost of the increase in excavation due to the despec-cut, the interest and despectation charges, and the great-ions in toils due to the delayed opening of the canal, it will be seen that sur estimate of time and cost for construction of the canal at sea level test tests within the bounds of probability

#### Apportioning the Responsibility for the New Haven Wzeck

HE Interstate Commerce Con HE internate Commerce Commission, in its report just issued on the New Haren week, ediase the opportunity to press hems the all-important fact, recently commented upon by this journal, that the safety of the travaling rabble is dependent upon the carriest co-operation of the whole personnel of a railroad, from the Board of Directors down to the humblest employee. It was not necessary for Consistence of the control of the property of the prope train accident." Such treatment was warranted by the fact that the Commission has heretofore expressed in strong terms its condemnation of the management of this railroad, when it has been called upon to investigate the rapidly-succeeding series of fatal accidents that have taken place within the last few years. In proof of its contention that the fundamental cause

dangers of travel on the New Haven Railroad is to be found in the lax system of management, the re port shows that, although the directors, after the West port wreck of 1912 had duplicated the conditions which brought about the Bridgeport wreck of 1911, vote the president "should make the most searching inves gation into the competency of engineers empirithe road," and "that nothing be left undone will conduce to greater safety in the operation of the railroad," the president was never called upon apparently, nor was any other official of the railroad, to present to the directors any results of such investigations as bud been authorised. "The directors," says the Commission, "assume to dispose of their whole re sibility on this subject by a vote depositing it in bulk upon the president, and thereafter as far as appears from the records, made no further inquiry and took no further action, although in quick succession these dis-

The president, general manager and superinten forthwith issued orders that all the rules should obeyed, etc., but no intelligent system was devised by oedyct, etc., but no intelligent system was devined by which to severation when rules were disologied. They were disologied largety, and only a small proportion of these violations were reported to official. "Rules were inhelicient," says the Commission, "a fault of the high difficial. Rules were indecentably entirely, the blams for which must be charged to the official, Asia

iscomotive engineers as well as a Commission of Connections. Take call, arising from the familiar of specially conditions. See a tendence. This call was a public bearings in this case."

Maving placed the predisposing cause disasters upon the shouldest of the s president and the higher officials, the Co our tint the direct cause of the disaster, we of the members of the train serve to obey a exercise the proper degree of caution. The was wholly inadequate—the bands should morely a change of color and not a change and the blocks having no distant signal. and the blocks betwing no discant sugmen-of a proper specing between the trained dispatcher comes in fer hierty eccentra-knew there was a heavy dag, he permitted it rates, running at apeals of from 80 to hour, to be busshed witche a distance miles, with only seven signals properly sehour, to be busined withth a distance has makes with only sevin similar peoplety and the most seving and the most seving similar peoplety and the maximum said speak allowable sider them of fag, yet no specific others or this bees given to the engineers. Commencent sever seem to have run lame of only-busin carrying their principes fright of passesses speed they pleased, regardless of the fact-could not see the signals until they were stram. Sitemals were oversuit; the fagman was could not see the aguan must trey were them. Signals were overrun; the flagman was before he could place his warning signal; the appeared to be ignorant of of at least inch the gravity of the chancion; and, in fact, the one gravity of the emission; and, in fact, the was such that any imparitial observer will ag-the Commission that "under such circumsta-not to be wondered at that an accident such occurred. It is remarkable only that accident character have not occurred to fill like with

#### The Small Eractor

HEN the "impersor" steased up the sea River on one of her resent translate our carried some five thousand people. It is abe is, by far the biggest machine thus far devised for conveying humanity across the cosan, her efficiency is limited. It took a dozen or more small taghosts to push and pull her into her berth so that the thousands on her decks could complete their journey. Every day the "Twentieth Century Limited" hurries business men from New York to Chicago and from Chicago to New York; but a small army of trucks, taxicabs, street cars and carriages is required to transport each passenges to and from the train.

ring a farm is not unlike running the "Imperator" or the "Twentieth Century Limited." While gines are employed in increasing numbers to take the place of draft animals, very large power units are re-quired. The rooting up of trees, the deep plowing of the ground, the threshing of the gasin, the multitude of operations that must be performed on a large firm all consume power in abundance. But there are also, little tasks that must be done, tasks which cannot anne mans that must be done, tasks which cannot be performed by one big machine economically. The orali-nary farm tractor will haul an eight-gang plow or a retime of cultivating implements vary cheapity and esf-cisedty. But when care or potatoes are to be culti-vated, power of a very different aut must be culted into

regulation.

All the mechanical breins of Europe and America have not as yet developed a machine which will deal it kinds of farm work economically and efficiently. The Germans have feeding more fasts than lie within the possibilities of a single American tractor. Their farmes are cultivated on the intended processing the problem of interducing mechanical power is such more difficult with them than it is with us. Yet out of fifty different models of small tractors which have been dereloped in France and Germany, there is but one result commercial machine, and that is pf German manufacture. The commercial success of that solitary mediate depends entirely on its shifty to plow. It quanto real a threshor; it cannot seen having the pends entirely on its shifty to plow. It quanto real and threshor; it cannot seen having the mostly seen handled machines of this type have been sold up to date. sition.

hondred memores date of the date.

Twenty tractors are built in America for each state in Burrops, and each American tracker one doesn kinds or work unknown to the power state Europe. Yet power regularaments with the dams at most return to the dams at the dams at most return to the dams at the dams at the dams are described to the dams at the dams at the dams are described to the dams at the dams are described to the dams at the dams are described to the dams at the dams at the dams are damned to the dams at down kinds of work unknown to the power of HUDDS. After power requiremental as the the varied, that we cannot expect everything to with one margine. Some day here work will arrive that the little sowt, hypothesis is Aspect present by exchange where we produce the contract of the contra

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difficit copy is disappearing. The "Section of the Largest Industry Mater Stemanship.—The "Section States" is a series of the section of the

propose, neer resigns capacity at 1,501 (1998).

Proposed few Neary Euret at New Yeshes—This Storesary of the Neary recently inspected the site for the new proposed neary yard at 16 New York, suggested by Cape. Van Hissier. Re is preposed to abandon, the present many yard at 16 New Hisse, which it is the Aslawed in worth from traditive to introduce and the Indian distinct Standard over to the day and to locate a new yard, containing bereiting accommodations for forty buttlebility and providing two accommodations for forty battleships and providing two derivations, each 1,200 feet in length, in the shallow part of New York Bay lying between the present channel to the continued of the status of Liberty and New Jersey. Larger accommodation, with thoroughly modern layout; consulting at all low with the continued to the continued consulting at all low with the continued to the great lines of railroad transportation, are the principal advantages to be secured.

principal advantages to be secured.

Crussed Liese Abandeas Queenstown.—The Cuhard Line ansonouses that for the future its steamers "Mauretania" and "Lustania" will make no call at Queenstown, the change being due to the desire to avoid the risk which these large ships inour when they enter that port. A good reason for the change is seen in the fact that on only forty-five occasions out of the one hundred and fifty-four passages across the Allania which these two chips have made, has it been possible to leave the mails at Queenstown. Northering the company will place in service the 900-600t "Aquitania" which will probably be a \$25.8 kmot chip. The change, or far as the public it equiestend, will necessitate a summinant carrier trailing to exist the boats at Liverpool. Queenstown, although admittedity a fine harbor, is too constrained for the safe maniouvering of the giant bulge of to-day.

"Throughgiddeer Leosewstew-At; the last named

the arts manufactured by the girls things of the August Manufactured by the state things of the August Manufactured by the state things of the August Manufactured by the August Manufactured Bandward Manufactured M

#### Electricity

Sections a push button. Prates No. 1,021,325 describes a push button for an electric doorbell which is provided with a eap that may be turned through an angle of 180 degrees to the right or left to expose the word "out." This will indicate to the caller that no one is at home, and it will be unnecessary for into push the button and waste battery current. If a doctor's offen were equipped with such a button it would prevent the dissurbing of other reambers of the family when the doctor was not in. doctor was not in.

doubte was not in.

Condanziship of Magnesimed Graphica.—Morris

Owes, says the Canadian Repireer, while investigating

the magnetic properties of the elements, found that

graphile was particularly susceptible to magnetization.

This led G. E. Roberts to investigate the electrical

resistance of graphic when magnetized. At first he

experiencested with lead pendla and then with bers of

various graphits. When the graphic wo magnetized

with the lines of force as right angles to the planes of

clearage, the electrical resistance was increased several

insuring per count in some cases.

hundred per cent in some cases. Lighting and Hasting Reposition.—The Imperial Russian Technical Scodety will hold an exposition of lighting, heating, and fire extinguishing devices in Sic Petersburg, from November 1, 1913, to Pebruary 1, 1914. The lighting section will include oil, gas and electric lamps, illustrating their use in the illumination of the home, public buildings, and streets; lighting or advays, engineering, mining works and factorist; in signaling; the lighting of silety differed in theaters; the reproduction of light effects in theaters; the reproduction of moving pictures, photogramsky, essentide work, etc. tography, scientific work, etc.

tograsply, estentific work, etc.

Tanjantames of Good Facetey Lighting in emphasized in a pisper by M. H. Flexuser and A. O. Diober read before the illuminating Brighnesping Society at Pittourgh, Pa. They show that feeding countries have taken up the agreetion a blote more astendarly than we have. They have that feeding countries have taken up the agreetion a blote more astendarly than the have. They have that countries appointed by the government wises circles are to study the efforts of good and bad light on the general basistin, and report upon methods of bettering conditions. Applicately, it is the first cost of the finestination that stands in the way of beyon lighting, and the authors of the paper have endeavored to show holv easily said chemply consistings can be bettered.

how easily and cheapity conditions can be betweed.

New Whiches Bulletins force the Eiler Tweez.—

Since the first of Suptember a special meteorological inuijoint for assimuate inse been sent breachest twins a day,
as 10-68 A. M. and S.P. Mt. by radiotelegraphy from the
Eiler Tower. The morning bulletin instances the brief
report of meteorological conditions at points on both
aboves of the Audania, heretotroe issued for the benefit
of maniners, and, in addition, weather reports from 14
places in western Europa. & Crossat of wind and weather
for France, the force of the wind at the summit of the
Eiler Tower at 7. A. M. and its monhable force during Eiffel Tower at 7 A. M., and its probable force during the afternoon. The afternoon bulletin is somewhat shorter but gives analogous information.

Improvements in Incandescent Lamp Mannfacture.— In a paper by Ward Harrison and Evan J. Edwards, read before the Illuminating Engineering Society, Pitteburgh, Pa., it is brought out that the strength of tungsten Pa., it is brought out that the strength of tungsten filaments has increased more than 300 per cont since 1908, and the strength of drawn wire has increased 40 per cent since 1911. The use of chemicals in the bulb which has become general during the past year has reduced the blacking of lamps to a marked degree and has made possible a substantial reduction in bulb size for everell knaps, thus reducing manufacturing costs and broadening the application of the lamps. The introdu-cion of colled filaments makes possible many new forms of lamps which heretofore oxidid not be manufactured. The strength of the filaments is increased by this process and the quadis-power maintenance is not affected.

The granged of the named is increased by this process and the candis-power maintenance is not affected.

Bleerfesty in Sumatra-Missan.—In Sumatra, the extensive Ombline coul mines are making use of electric methods on a large scale. In the present case the galleries run directly into the side of the mountain and tead to the mines proper which make up three levels. The coult is taken out of the mine by electric locomotives of the entenmary mining pattern which had the trains of small constructives are registered to take the sour down to the levels. As the mines are higher up in the mountain than the railroad station of Savah-Locato, the small locomotives are registered to take the sour down to the leading station upon trolley electric tracks. Parallel to the first electric line has now been man a second trolley mead, but this service for large electric boomotives and one; which, are used for hading station when a second trolley mead, but this service for large electric boomotives and one; which, are used for hading station when a second trolley mead to the first service for his mines. Current is also employed on a large that there is not a place of the service of the mines. The course of the service of the same parallel parallel service is not a place of the service of the same parallel service which we see the service from a steam plant which sends compared him of the parallel service in a high tension space.

#### Science

Midday Darkness at Glasgow.—British newspapers manday Darkness at Glasgow.—British newspapers report that on June 19th, while violent thunderstorms were being experienced in various parts of Scotland, a dense pall settled over Glasgow, and at noon the city was plunged in midnight darkness. Heavy rain fell soon after.

A Meteorological Station in Greenland was maintained A meceoroopea Station in Greenland was maintained all last winter by Drs. Stolberg and Jost, of the Swiss trans-Greenland expedition, in the vicinity of Godhaven on the west coast (faitude 70). The observer report remarkable alternations of temperature through the winter, coastonal John winds from the east giving temperatures as high as 59 deg. Fahrenheit.

Prince Albert of Monaco, distinguished as an ocean-ographer, arrived in New York Soptember 9th on his yasht "Hirondalle," which is especially fitted up for scientific investigations and carries a large ascientific staff. He left two days later for a shooting expedition in Wyomigs, the yasht meanwhile returning to France. Early in October he will visit the government seismittle visit in the property of the prop

sary in October he will visit the government seienthe institutions in Washington and probably isoture before the Washington Academy of Science.

The Carnegie Engineers Are Safe.—Concerning the fasts of the expedition headed by Dr. Alfred Mayer, director of the Department of Marine Biology of the director of the Department of Marine Biology of the Carnegie Institution, which sailed from San Francisco July 23rd for the East Indies, and was recently rumored to have been meassored by cannihals in New Guines, the disector of the Institution in Washington states that. Dr. Mayer and his party have been heard from since the report of their measurer was circulated and they are undoubtedly safe.

Inflorment with Flants in Great Britain.—The fact that several species of Britain plants, including some of particular beauty and encown, are in danger of extinction owing to ruthless gathering on the part of the public in general and nurserymen in particular, has recently formed the arthur of many communications to the British the subject of many communications to the British scientific journals and newspapers, and was actively discussed at the last meeting of the British Association. obscissed as the last meeting of the British Association.

Opinion seems to be divided as to whether or not the appropriate remedy is to be sought in state protection. Although many wild birds and other members of the animal kingdom are now commonly protected by law in civilized countries, there are few precedents for the state protection of wild plants (one of the few being state protection of wild plants (one of the few being the case of the climbing fern in the United States). The education of public opinion on this subject and other protective measures have been undertaken by a com-mittee of the Schorne Society. One proposed remedy is the establishment of plant and forn sanetuaries, or at least gardens set saids in different localities where every rare British species might be carefully preserved and

The Scott Fund raised by the Mansion House com-mittee in London will be divided between grants to the relatives of those lost in the recent expedition, the publication of the scientific results, and the erection of me-morials. Lady Scott andMrs. Wilson are each to receive £8,500; Captain Scott's mother and sisters, £6,000; Mrs. Bowers and her daughters, £4,500; while £3,500 is provided in trust for little Peter Scott. Smaller sums are allotted to the family of Petty Officer Evans. The sum of £17,500 is provided for working up and publishing the scientific results, which are to be edited by Capt. H. G. Lyons, F. R. S. The memorials will include a tablet in St. Paul's Cathedral, and a group of statuary, which it is proposed to erect in Hyde Park facing the new premises of the Royal Geographical Society. A particularly fit-ting scientific memorial is provided in the shape of a trust fund of some £10,000 for the endowment of future polar research. Although no provision is made for the relatives of the gallant Oates, who need no assistance, the members of his regiment are raising a fund for a

Foreign Names in French Journals.—Carelessness in revesta Names in Frence Journals.—(arcieseness in spelling foreign names is not peculiar to any one country or to any one class of literature, but, with the possible exception of American daily newspapers, there are probably no publications in the world so remise in this respect as the French journals of popular science, while most French periodicals and books of all kinds are not much better. The evil is not merely an offence to the purist, but sometimes has serious practical consequences, as when a reader wishes to consult the original publications of a writer whose work is quoted or abstracted, and whose name is so distorted as to effectually hidehis identity. One of the journals classed above recently referred to Sir Oliver Lodge as "Olaver Ladges," another periodical, apropos of the record halloon ascent of Berson and Süring, transmogrificu the names of these gentlemen into "Berson et Kuhling;" Dr. H. von Floker's recent studies of john winds are attributed in L'Acrophile to one "von Flüker;" and so on, at any in the studies of the seems quite impossible for a Ceruman writer to be satisfied with a single "n" in the final syllable of a personal name ending in "-man." purist, but sometimes has serious practical consequence as when a reader wishes to consult the original public

# How Trees Are Converted Into Paper

A Trip Through a Paper Mill

By Thomas J. Keenan, F.C.S., Editor of Paper

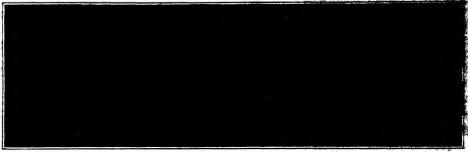


Fig. 1.—Slasher of a large ground-wood pulp mill. Here the wood is sawn into uniform places of the required size.



Fig. 2.—Charging a magazine grinder with wear The grinder holds enough for a twelve-hour shi

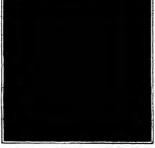


Fig. 8.—The newest type of magazine grinds operation in a Niagara Falls paper mill.



Fig. 4.—The ordinary type of grinder used in a ground-wood pulp mill.

A GREAT chemist once observed that a nation's wealth could be gaged by its consumption of sulphuric acid. He might have added that a modern nation's culture and refinement may be estimated by its use of paper. Granting this, the progress of the United States must provoke the wonder of the world, for from an unpretentious beginning the American indus-try of paper making has expanded during the past decade until the invested capital amounts to more than \$400,000,000, with a yearly production approaching \$300,000,000 in value.

The raw material of the paper on which the Scien-TIFIC AMERICAN and nearly all books, magazines and newspapers are printed is wood, but the process of desired, and hence originate the different kinds and grades of book, magazine and newsprint papers

Converting Trees Into News Paper. ody of ordinary newsprint paper, such

The body of ordin up the interminable "extras" of a m up the interminable "extras" of a metropolitan even-ing newspaper, consists of a mechanically prepared pulp known as "ground wood," combined with a defin-tic proportion of a chemically prepared pulp, which is called "sulphife" for short, and a certain amount of china clay to impart weight and an even surface to the printed paper.

The term "sulphite" as applied to paper is not so

The term supports as appear to paper is nor so well understood as it might be, even by paper salesman, and it is used very loosely by all classes of consumers, who appear to attach some derogatory meaning to the word. The name is properly applied to the pulp which is produced by boiling a selected wood, usually spruce in a solution of the acid sulphites of lime and m under high pressure, until all its juices, resine and gums, or non-fibrous material, are dissolved out and the skeletons of the plant tissue, countiluting the fibers, In the subsequent processes of washing and bleaching all traces of the suiphite liquor are removed, and the puip so produced represents nearly pure cellulose in fibrous form. Set this is a digression, and in order

return to the basic substance of newsprint paper and

return to the basic substance of newsprint paper and twee the transformation of tree to pulp. While sprace wood was up to a year or so ago alone employed for the manufacture of ground wood pulp, baisam fit, hemick, lodgepole pins, jack pine and mix-tures of these woods are now used largely for the same purpose. This was made possible by a study of gridding conditions undertaken by Government acientory, Wausau, Wis. The wood is first freed from bark, then cut in lengths varying from 24 to 30 inches, or used full cord size of four feet, depending on the form of grinder used. There are only two pulp mills in operation in the United States equipped with the form of magnaine grinder adapted to accommodate a full length log. In the ordi-nary form of grinding apparatus the piece of wood is forced by hydraulic pressure against a revolving grindstone under a stream of water in such a way that the pulpy fibers are torn from it obliquely so as not to divide them, but to pres in their greatest length. rve them as much as possible

in their greatest enter the transfer of pulp flows by gravity to a screening apparatus where the silvers and unground himps are removed, and the liquid pulp then undergoes a number of other screening, straining and delayfirsting processes before it is considered similarinity month and out; for pressing into laps, or is ready for the besting engine, if it is sent the processing that the processing the process if it is not to be stored, but converted directly into paper. In the beater the ground wood receives its admixture of chemical or "sulphite pup?" and the soldsing matter, day, roain and since which go to make up the body of newsprint paper. After the addition of the body of newspritt paper. After the addition of the required proportion of sublishe pulp, passally from 90 to 25 per cent, and a carefully measured quantity of him and red dysculf to correct the yellow tons in the pulp, from 8 tp 15 per cent of very via addid, 155, lowed by a definite amount of reals, sidiles, (made by combining road with soda sail, and a 'quantity' of alway sufficient to precipitate the roads throughout the liber attent of course of him throughout the alum sufficient to precipitate the room throughout the fibers, where it serves to bind them and make the

A CONTRACTOR OF THE PROPERTY O

finished paper partly resistant to the absorption of ink, newsper paper is but lightly sized compared with writing papers, bonds, ledgers, etc., which are doubly sized in the bester with resin and with animal size or

sized in the beater with rosin and with animal size or give after they leave the drying crimders. The Evolution of a Sheet of Paper. Having described the various processes employed in the manufacture of pulp it remains to follow the contests of a beater—the "furnish," as the assembled putps, loading material and sixing are conveniently termed insuring inservial and mixing are conveniently termed— through further refining measures and dilution until it passes, a thin milty fiuld from the flow box, through the slices, onto the swiftly traveling Fourdrinier wire, an endless hand of copper gause, which in addition to its forward motion has a regular reciprocating shaking motion, with a frequency of 360 shakes a minute. While she slowly forming these of interlooking fibers is being hurried on its way to the first press roll, th as wang nurreed on its way to one are press rol, the water drains away through the perforations in the wire, the thin film of pulp being further deprived of moisture in its swift passage as the drivers by section boxes or revolving "Sectior rolls in contact with the under markets of the wire close to the souch roll where tools of veroring sector roles in contact with the under warkee of the wive close to the couch roll where the wire turns on its reverse journay to the breast roll. The listing of the delicate these of spicker web linears from the wire entre the couch roll, wheet the mandate is fast destroit, is an autonomizingly marrisings performance. The gaussilies web is themselved automatically and appeals of the couch gain ty a special attachment of great delicacy of superstine. These thin turns of paper is only in its forestire's standard attachment of great delicacy of superstine. The time of paper is only in its forestire's standard for the presentation of the country to the country to the standard on the presentation. The clump tools of a main's testing special place of mechanism, which life is standard to to continuity, so this is received, as both to the continuity, as this just according to the country to the paper of the standard form which the continuity of the paper of the standard form which the standard is the standard form which the standard is the standard form which the standard form there is supported to the standard form there is forced to the standard form there is supported to the standard form the supported to the standard formal standard formal standard formal standard formal standard for the standard formal standard fo

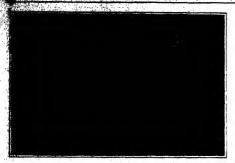




Fig. 5.—Shredding the baled ground-wood pulp in a Brocklyn paper mill.

Fig. 6 .- Reating engines in a Brooklyn paper mill; each holds a ton of pulp.

end of the machine (illustrated in c am of the macrine (illustrated in colors in a fine artistic conception on the front course page of this week's issue of the SORKETSING AMBRICAN) inskes demands on the machine bunders which necessitate tant watchfulness and no little degree of muscular strength and activity of movement. If the stock has not been carefully ground and beaten, breaks are likely to occur with exasperating fre-quency and necessitate stopping the dryquency and necessitate stopping the ary-ing cylinders until the sheet has been caught and freed from a possible entan-glement in the upper or lower tiers of driers; measurable the pulp at the wet end of the machine may be draining as "white water" to be pumped bac later through pipes and acreens to the flow box, from which it again resumes its course over the traveling wire in the

direction of the press rolls.

The idea of a machine for making contimous rolls of paper was conceived by a Frenchman, Nicolas Louis Robert, in 1708. The machine constructed by him did not The macains constructed by him did not produce a web of indefinite length, but one limited to fifty feet. An endless band of wire screen ran over two rollers. The pulp in the vat was conveyed to this wire by a blade wheel over a breasting. In its passage over the wire the water drained from it passed back into the pulp vat, which occupied nearly the whole of the lower portion of the machine and was ed over and over again, as at present. The machine was worked by hand.

The Fourdrinier brothers (Henry and Sealy), whose name is perpetuated in the rn paper-making machine, obtained patent rights on the machine invented by Robert, in 1806. The paper made on the machine used by the Fourdriniers in their mili at Frogmore, England, was twelve es to twelve feet wide, of a length not exceeding fifty-five feet. The machine was not equipped with a drying cylinder and the paper had to be taken off wet and hung up to dry.

It is a far cry from the days of Robe and Fourdrinier to the present time, when the Fourdrinier parts of a paper machine are made in instances of a width of 202 inches, while the wire, 200 inches wide, is capable of be ing aper ed up to 808 feet a minute to make a roll of paper eight miles

What is "Sulphite" Pulp? perishable nature of ordinary n print paper is due to the presence in the ground woodpuip of the sup, lignin and resin of the tree, substances that oxiding the paper and make it brittle. The sul-phits process rields a pulp that is free from these objectionable products, which from these objectionship products, which are decomposed in the socking of the wood, or dissolved away and more or less completely washed out with the first wa-ages active the pulp is discharged from

parters, plate pulp in manufactured shiely springs wood. The wood having besting due to have been a present of the hart, others, the present wood process, is

Electric de la companya della companya de la companya de la companya della compan



-View of a large machine room from the "wet end" of a Fourdrinier machine. In the foreground is a machine that makes paper 184 inches wide.



Fig. 8.—At the couch roll where the wire reverses. Here the delicate gauzelike tissue is lifted from wire to roll.



Fig. 8.—At this point the paper begins to form on the Fourdrinier machine. The machine attendant is fusning over the "doctor," which scrapes the roll.

chimsel up into small pieces or chips about one fourth luch to a haif luch thick and boiled under pressure in large steel digesters capable of holding twenty tons of wood at one operation and yielding ten tons of finished pulp. The digesters are lined with heavy cement backing, faced with brick, pointed with lithurge and glycerin to avoid contact with the metal, and the huge steel cylinders are fortified against bursting under pressure and extremes of temperature by butlstraps on the inside and outside of the shell of steel.

The sulphite liquor in which the wood holled is made by passing sulphur dioxide—obtained by burning either supplur or iron pyrites in special ovens luto tanks filled with water and a known quantity of slaked line (prepared from dolomite) This results in the formation of a solution of the acid sulphites of cul cium and magneshum, which is the active solvent agent Ordinary limestone is used in many pulp mills, but dolomite ylelds a more powerful extractive solu-

When the digesters have been filled with the wood chips and the requisite quantity of sulphite liquor is udded, the manhole or cover at the top of the dige is securely fastened and steam turned on gradually nutil the pressure reaches seventy or eighty pounds. The cooking is stendly maintained at this pressure for a period of eight to ten hours. At the end of this time the contents of the boller, consisting of the disintegrated fibers of wood, are discharged into large vats and washed. The spent liquor containing the dissolved resinous and non-librous portion of the original wood is allowed to drain away, and the tank is then washed out and made ready for another

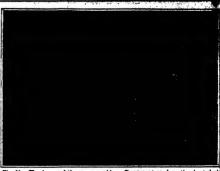
Sulphite pulp is increasing in use throughout the country. The quantity used during the decade 1899 to 1909 increased 781,759 tons, and of the cuttre quantity of woodquip used in 1999, the quantity of woodquip used in 1999, the latest census figures available, sulphite pulp constituted 42 per cent as compared with 356 per cent in 1899 The output of sulphite pulp hereused 1446 per cent dur-ing the decade and that of ground wood pulp 101 1 per cent. A constant's increas ing amount of sulphite pulp is imported annually from Camada, Sweden, Norway

#### The Process of Making Soda and Sulphite Pulp. The soda process, yielding so-called soda

putp, is used for soft woods like poplar, cotton and basswood, whereas the sulphite process is exclusively employed for contferons woods. The chipped wood is boited in a solution of caustic soda for eight or nine hours at a pressure of seventy or eighty pounds. The pulp produced is soft and bleaches well, making it espe-cially well adapted for the manufacture of book and magazine papers. The better grades of magazine paper are composed of a mixture of suinfitte and sods online and these, if thoroughly well cooked and



-The paper is now fully formed and on its way to the drying rolls, of which there may be as many as forty in a large machine.



-The dryers of the paper machine. To prevent condensation heaforced into the room and a current maintained by exhaust fans. is forced into the rec

carefully bleached, are almost equally as permanent as rng stock

Sulphate pulp is prepared by bolling the wood chips in a solution of sodium sulphate containing some causthe sodu and sodium carbonate. It is a slower process than either the sulphite or the soda, as the period of bolilug Instead of being eight or nine hours is some times extended much longer, though good results have been distilled with a modified process in which the period of cooking is much shortened. The process is more economical one than the simule caustic sode since, notwithstanding the case with most of the netive chemical agent is recovered in the latter, there is still a loss of 8 to 10 per cent, even with efficient recovery plants. In the sulphate process this loss is made up by the addition of sodium sulphate (Glauber's vit) in the place of caustic soda, thus effecting a c asiderable economy, as the price of cus-tic is much higher than sulplute. The principle of the process depends on the fact that in soda recovery, when the concentrated liquors remaining after all the cellulose has been extracted from the wood are burned to ash, the sulphate reacts with the organic matter in the liquor and is thereby reduced to sulphide, and by sence in the liquor subsequently made oxidation its presence in the induor sunsequenty made optication of the fiber is prevented, so that a good yield of strong pulp is obtained. The so-called "kraft" papers are made by this process, which is not a popular one, as the gases formed have a very offensive odor, like that of rotten eggs, which affects the whole neighborhood of the mill and makes the atmosphere almost unendurable. The manufacture of sulphate pulp promises the de-

velopment of a great industry in the Southern States, where there is an abundance of raw material in the pines indigenous to that region. The profitable dis-position of the whole timber as well as the waste and stumpage of southern place in the manufacture of paper pulp is a problem on which the Forest Products Service

of the United States Department of Agriculture has been working for the past two years, with very encouraging results. It has now been established that long leaf pine is well adapted for the manufacture of nat ural-color "kraft" pulps and paper, the heavy brown wrapping paper of the stores, and that by the sulphate process a grade of "kraft" paper can be made equal or superior in quality to the imported or domestic "kraft" papers now procurable. A large company has been recently organized to build a mill in Florida, and this ls regarded as the entering wedge for a number of

# The Disposition of Waste Liquors One of the weightest problems confronting

One of the weightest problems confronting the manufacturer of chemical pulps to-day is the disposition of waste liquors. He is eager to be informed of a me of utilizing the spent lyes from the sulphite process that would obviate the present necessity of throwing them into rivers and streams in such large quantities

as has been done up to the present time.

By neutralizing the waste sulphite liquor and starting fermentation of the contained sugars, alcohol of ing rementation of the contained sugars, alconol or a low grade is produced from it in several pulp plants in Sweden, and by a patented concentration process used in the 'inited States, a compound is separated, which is utilized as a binder in road making, as a tanning extract and as an adhesive for sand in making molds and cores for iron in foundries. But the profitable recovery of the organic matter dissolved from wood in the sulphite process is still an unsolved prob lem, notwithstanding the fact that it has been deeply studied by able chemists for more than twenty years

In the sods and the sulphate proces making there is effected a partial recovery of materials and of power, by incincrating the spent soda liquor, after evaporating and concentrating it, the soda lixelf is regenerated, but there is a total loss of the organic

derivatives of the wood, which are burned up in recov ering the soda

oring the soon.

A Modera Tendency in Manufacturing Paper.

Ten years ago it would have been deemed exceedingly difficult, if not impossible, to operate a paper mill at any distance from the sources of supply of wood and of power, that is to say, from a well watered forest region, but during recent years, in the progress retire region, but during recent years, in the progress of the paper-making industry, water and steam have been generally displaced by electricity as motive power, developed by turbo-generators, and the machinery of modern paper mills is driven by direct-connected motors in place of the shafting and belting which dised the older mills.

An interesting development in the manufacture of An interesting development in the manufacture of newsprint paper is being witnessed in the harbor of New York, a paper mill having been constructed on the South Brooklyu waterfront with a capacity of 100 tous a day. The ground wood pulp is manufactured in Canada, and brought to New York Harbor in car-ces of 5,000 tous by steamship and landed at the dock from the manufacturing plant. The pulp arrives in bales weighing about 400 pounds each. In a building on the dock the pulp is passed through a shredder, where it is fluely divided and agitated with water until it is reduced to a fluid form, when it is pumped directly to the beating engines in the mill proper. As the pulp enters the beaters, of which there are six (three for each paper machine), each capable of holding 2,200 pounds of material, there are added to it 20 per cent of sulphile pulp, the clay, coloring matter and sking which complete the "furnish." The mass is beaten and circulated in the engines for one hour, after which it passes down to a large concrete lank in the basement, called the "stuff chest". Here it is diluted with a large quantity of water. Next it is drawn up by powerful pumps and passed through a Jordan engine



Fig. 12.-The "dry end" of the two large mach ines which are shown in Fig. 7. The machine in the center make s paper 194 inches wide at a rate of 880 feet

#### Correspondence

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a addigre are not responsible for that in the correspondence column. Ananymou red, but the non ne connot be consi stabeld tok

#### Sea-level Canal Fallacies

To the Editor of the Scrawfirst American: I have been considerably interested in reading your criticle on the above subject in your sens of the 16th

doubt that this article will invite o

a mew no course max this arrace will livite con-troyers, as I do not think that your correspondent's views are altogether sound. There are many critics, I imagine, and also some of the best engineers in the States, who pelieve that it might have been possible, and indeed better, to have built the Panama Canal at

Sections.

You say that you doubt that any engineer could be found to-day who would advoasts such a canal. I do not think that there would have been any difficulty in finding such an engineer, but would prefer not to mention

names at the present time.

Further, I do not understand why you lay down as a kind of axiom that any kind of a canal at Panama must kind of axiom that any kind of a canal at Panana must be provided with looks. When we consider the com-paratively short time of tidal flow, that the canal is nearly 50 miles long, and that the Gatun Lake has such a large volume, does your correspondent seriously put toward that this ten feet difference of tide would cause such a current as to render navigation difficult, especially

in a canal with such a large cross section?

Judging from the experience in the Manchester Ship Canal in England and in other ship canals in Canada and the United States, I do not believe that the our

and the United States, I do not believe that the ourrent would be large or difficult to navigate. With respect to the question you have raised about the size of ships, as the locks will certainly out-live (the effect of carthquakes excepted) the "Ille-time of the youngest onlid that can read the Scheritz Cantincan," I do not think that your argument is a reasonable one, and do not see any reason why in some future, ships using the canal abould, not be existing which would

sups using the caloat about not be existing when would require long-looks than those provided.

Later, you say "nature has decreed that no sea-leve canal shall ever be constructed at this isthmus." I do not think that there is any evidence of such a decree and I do not believe that there is any doubt that a sea-I do could be constructed

The Culchra cut is certainly a deep excavation, but nould the further 85 feet below the present bottom of the prism prove to be rook, there would be no further fifculty caused by the slipping of the slopes; should, waven, it was the slipping of the slopes; should, should the further 85 feet bele owever, it prove to be soft, certainly, as a last resource this extra depth of the cutting could have been removed by dredging, in which case the water would assist to support the sides of the prism.

In your last paragraph you practically say that it may be stated that if the canal were cut through the "divide" down to see-level, the time and cost of con-struction would be doubled 1 do not see any reason to believe that such a "hard-and-fast" statement would

Finally. I have heard it stated that the canal is being d as a lock canal on a minority report, and that this was done for the reason of expediency; if this be so It would certainly show that some well-known engineers believed that the sea-level canal was not only possible, but certainly desirable.

I am now crossing over to Europe, and hope that you will have some further reference to this interesting subject

from your correspondents.
R. M. S. "Lusitanis." M. I. C. E er is discussed on our Editorial page.-Ep.l

#### Prevention of Aviation Accidents

MANN TERCAMBULATION AND A STATE OF THE STATE

To the Editor of the Scientific American:
The recent fatal accident to Emign Billingsley of
the U. S. Navy, with the miracle-like escape of his
companion, Lieut. Towers, would seem to furnish an explanation of many other aviation accidents and suggests two things that should be done to prevent similar accidents in future. The survivor explains just how the mishap occurred, an upward wind gust having oridently struck the tail, or rear elevator, causing the machine to suddenly dive forward and downward, throwing out Billingdey, who was huried 1,500 feet to his death, while Towers dung to an upright and survived when the machine crashed into Chespeake Bay. A quite similar acoldean briefl an acrosspeake Bay. A quite similar acoldean briefl an acrosspeake conceeded in regulaing his seat and righting the secreplane sites being thrown forward from his seak when a warm, seanching sit current evidently struck the rear: elevator. Harrist Quinby and the passenger wave thrown out one one control to the control of how the mishap occurred, an upward wind gust having tion the numerous other aviators who are I have periahed similarly. The two lessess to b

from these cases are: First, that the aviator and sengers should be held in their seats by a strap or sin sengers meren, so ned in their sease by a steep or similar device pissing in front of them but of course instantly removable when desired, and second, that all acro-planes should be provided with both front and rear elevators, so that in case of a strong ascending or de-seanding current striking one but not the other, or satiking them at different moments, the opposite one would instantly oppose to a great degree any sudden upward or downward movement, even before the water could adjust the elevators to counteract the movement; for with the two elevators connected be rear flap were forced upward despite the aviator's grasp on the lever, the front flap would turn downward to elevate, as needed, anticipating or at least aiding his movement of them; and if the elevators included little or no fixed horizontal surface, but simply consisted of planes pivoted at points much nearer front than rear of them and turnable through sixty to ninety degrees, with stops on each side, such upward or downward air currents could not materially upset the longitudinal balance of the machine; but if, with consideral fixed horizontal surface attached, the strong upward or downward current, acting on it as on a sail, should break or disable one elevator, the aviator would still break or disable one elevator, the aviator would still have the other one to depend upon for said landing, more especially if each elevator were connected by its cable to a separate lever, with the two levera arranged side by aide so as to be grasped in the one hand, and by having pulley bell-lightoners attached to such or one elevator cable the relative angles of the two ele-vators could be changed during flight or set as found best by means of levers connected therewith.

In conclusion, the writer is convinced that all aeroplane controls should be duplicated. For instance, the ordinary rear vertical rudder for lateral steering, and ordinary rear vertical rudder for lateral steering, and on which the lateral balance so much depends, especially at times, abouth be duplicated at the front (as I believe is done only in Capt. Cody's machine), or else pivoted vertical resistance surfaces could be easily provided at the lateral ends for steering purposes, as in some seroplanes, or all three steering methods used, two or three levers being preferably arranged to be grasped in one hand for the purpose, as above described; for a contraver side cust may be a suppressed as the contract of the purpose of the purpose of the contract of the purpose of the contract of the purpose. graped in one hand for the purpose, as above described; for a contrary side gust may sometimes prevent a rear or front vertical rudder from steering the erast as desired, or as necessary to preservo balance.

By using such duplicate controls, the writer believes

By using such duplicate controls, the writer believes that aeroplaning will be made as and as at lever can be; for I venture to predict that the successful, safe, and efficient flying machine of the near future will be a combined helicopter and aeroplane. It is with the hope that these suggestions may help to lossen the death toll of aviati on that they are here given, and ore may follow later. ELMER G. STILL.

ore. Cal

#### Fire Protection by Automatic Sprinklers

To the Editor of the Scientific American: The second editorial in your recent number referring to the disastrous fire in Binghamton is all right so far as it goes, but it strikes the writer that it missed one of the strongest points which could have been made with regard to improvement in conditions which would

make impossible a repetition of such catastrophe.

In the August number of the Journal of the American clety of Mechanical Engineers, the case is vory well nd 1273, as well as, in a certain put on pages 1272 as sense, the remarks at the bottom of page 1269 and top of 1270. Particularly in the middle of page 1272 is the point made clear, that every time a sprinkler operfrom fire in a building full of people, it is a potential

The writer has been studying this subject of Automatic Sprinklers, and their use in saving both property and life, for some little time. So far as I have been able to learn, there have been just eight deaths b fire in factories protected by automatic sprinklers. It not a single one of the eight cases could the death be charged to the failure of the sprinklers to operate prop-

onaryon to the faint of the spiniaries to operate pro-erly, as you will see by considering the details. In January, 1907, under peculiar circumstances, a fire gained great headway in the Cocheco Mills, Dover, New Hampshire, at a time when the automatic sprinkler system had been temporarily shut off for adjustment This was a cotton mill, and the spread of the fire was so rapid in the cotton goods on the machines, and up through belt ways, etc., that five of the employees, who attempted to save their belongings in their lookers, were overcome by smoke, and lost their lives. The were overcome by amoke, and met their rives. The agrinkiers were not operative at the time the fire broke out. Before they could be adjusted and put in service the damage had been done. This is, of course, a strong argument in favor of kepting all such equipment at all times rused for immediate service.

times ready for immediate service.

About a year ago a celluloid comb factory near Boston was the scene of a fire which flashed all around the room in the scraps of extremely infianmable celluloid on the work benches, making a complete circle of flame, which suit off the access to the stairs. About dosen employees in the room deshed through the

flame and down the stairs, all being more or less severely burned, and two of them losing their lives. Please note: Before the fire department arrived on the scene the automatic sprinklers had the fire completely out. would, of course, be too much to have expected I t. employees to remain within the circle of fiame for sixty or ninety seconds required by the sprinklers to put out the fire. Probably no human being under h circumstances, and with the panic which is always nected with fire, would have remained at this time. It is perfectly clear that if all the employees he in the room, the chances are that none of them would have been severely injured.

The other case where life was lost under automatic sprinklers was in a plane factory in New Jersey also about a year ago. The watchman's lantern expleded, while he was making his rounds, and set fire to the inflammable varnishes in the room through which he was passing. He was so severely burned as a result of the initial explosion that he died the next day. The sprinklers held the fire from spreading, giving the fire-

men an easy task in putting the fire out.

Practically every expert who reported upon the results of the Asch Building fire in New York two years ago said that automatic sprinklers would probably have prevented the loss of life in that building. As you probably noted, automatic sprinklers have been since installed throughout that building.

The National Fire Protection Association shows ords of some 15,000 fires in which automatic sprinklers have figured. The three cases above mentioned are the only ones in which loss of life has occurred, and the es, in those cases, were so peculiar that as matters stood, the sprinkler may be said to have a clear record, so far as life saving is concerned The matallation of fireproof stairways will do much

to help matters along They are, however, no means of surety against panie, and should be considered simply as one of a number of devices, all with the same end in view. They would probably be more expensive to Install in an existing fire-trap than would a satisfactory system of automatic sprinklers. They would be less effective as a life-saving device, and not at all effective, from the dollars and cents standpoint upon the saving of property. Sprinklers would save both lives and property, and pay for themselves in a period of four or five years, through reduction in insurance rates. Which, under these circumstances, do you conder the better scheme to advocate?
So far as the fireproof building is concerned, the

starway will not make it more fireproof, and in very tall buildings, such as some of the loft buildings in New York, the space requirements for such a stairway to accommodate hundreds of operatives all at the same time, would be prohibitive. The sprinklers, by confining the fire to a more handful of flames, so to speak, would make it unnecessary to empty the building in any such hurry, and would soon come to be recognized in its true light, as a life saver and a panie det

Cases are on record where a fire in a waste basket full of paper has been put out by a sprinkler before the waste basket was consumed. The sprinklers operate without human assistance, are not subject to conditions or excitement, are not hampered by smoke or a sudden flash of flame, are not hindered in their work by a rush of frightened human beings running away from the seat of disturbance

To my mind they are the only great saving factor in our fight against fire, and should be required (legally) in all manufacturing plants subject to destruction.

They can be put into existing buildings at nominal onse, and render what is now a fire-trap, more as against both panic and lose of life, than any fireproof" building now existing, which does not contain sprinklers. If you consult the real estate adver-tising pages of the New York Herald you will find building after building designed for loft and manufacturing purposes making capital of the fact that they are pro-

teeted by automatic sprinklers.

I have nothing to do with sprinklers from any business point of view. I am, however, intensely interested in the very live subject of the conservation of life and SIDNEY G. KOON. ımulat d resource

Boston, Mass

[The writer of the above letter is in error in his supsition that the editorial referred to advocated the building of fireproof stairways as the sole protection against fire; nor will even a cursory reading give this impression. Automatic sprinklers are one very efficient and well-established method of fire protection, as the facts given in the above letter will show.—Editor.]

Street Accidents in London have increased at an alarming rate with the increasing use of automobiles. Giving ing rate with the increasing use of automomies. Giving evidence before a parliamentary committee on motor traffic in London, Colonel Hellard, chief of the London traffic branch of the Board of Trade, recently stated that in the metropolitan area last year there were 537 deaths from street accidents, as compared with 155 in 1904, while over 20,000 persons were injured, as comared with about half that number in 1904.

Salar Carlos Car







Paper testing laboratory of the National Bureau of Standards, Washington.

that when specifications are prepared for similar samples or product they are based on minute and systematic knowledge. In its work the paper testing laboratory seeks to co-operate with paper manufacturers generally,

and the remits of its investigations and researches are easily available, while its apparatus and modes of testing can be avanished at any time by those interested. Aside from technologic research the testing of pa-

per, as carried on in this laboratory, presents many

# How the Government Tests Paper

#### The Methods and Machines of the Bureau of Standards

By Herbert T. Wade

 $E_{\rm VERY}$  year some 40.000,000 pounds of paper, in-buthond Government for use in the manufacture of bank-notes, postuge stamps, and post circls, and for printing, stationery, and other purposes. Every your a continuous succession of valuable documents is issued from the Covernment Printing Office and it is obvious that the purchase and test of paper is no small matter For the sake of completeness and furness the meth-

ods of test are made as comprehensive and scientitically exact as possible, thanks to the co-opera tion of the National Ba-renu of Standards in Washington. Par some ten years this bureau ims been carrying on a complete investigation of the technology of paper nucking, not only with the nary routine tests in-volved in passing on Government supplies but also with the aim of evolving standards of material and product as well as standard methods of testing These would find expression 1 n standard citications lending to uniformity to the paper furnished noder the various contracts, and afford opportunity for up ordi mary buyer better

It inlight be said in passing that in Germany such investigations have been carried on for a much longer period, and that the most systematic studies of paper making and its materials buye been unde und accurate und elaborate methods and machines for testing inve been developed. In fact the German investigntors have even made a scientific classification of papers based on their chemical and physical properties as ascertained by analysis and test, but so refined and minute is much of their work that it is said to be in advance of present conditions in the German paper trade.

termine the applity of

At the Bureau of Standards there is main-tulned a special papertesting inhoratory equip-ped for microscopical

supplied with instruments and apparatus representathe of the best American and German scientific and commercial practice. There is also a small size papermaking plant where the pulp can be prepared and actually worked up into paper on a paper-making machin The nim is to produce standard paper samples in which the liber content and other materials and the actual processes of nanufacture are accurately known, so

examinations, chemical analyses, and physical tests and



Mullen strength tester. A "bursting" machine that





The quadrant paper scale. Reading the weight per ream from the test of a single sample.

Schopper strip tester for measuring and register ing breaking or tension strength and elasticity.



points of general in The tests may be classed as physical, microscopi-cal, and chemical, the first named, perhaps, being of the greatest conand consumer, and in addition being the simplest and most readily under stood. The physical prop erties of course depend upon the chemical conods of manufacture which by analysis, but they afford a very good idea of the ordinary qualities and characteristics of the paper, particularly in connection with the anedesigned.

How the Weight is Ac-curately Determined.

The first test to be ap-plied is a determination of the weight of a given grade or sample. Paper is sold usually acco its weight per ream of 500 or 480 sheets, each by 36 inches or some other standard size, as determined. A single sheet is taken. rolled up and weighed in a suitable scale or balance and from its weight the weight of the ream is computed, or in the case of the quadrant scale illustrated, read off directly for reams of 500 and 480 sheets from the graduated circular arm. Of course a smaller sheet or portion of a sheet may be used and the weight of a full size sheet or of

Fig. 1.—Diagrammatic view of a compression system, consisting of four units parts—compressor condensor, expansive view and exaperated out of refrigeration cold. Fig. 2—quadruple acting compressor, showing housing of views in critical and parts—for keeping down hest generated during compression. Fig. 3—funded animolia condenses, atmospheric type. The condense of the condenses of

New machines that produce cold.

# Recent Improvements in the Refrigerating Industry

#### What the Inventor Has Done for Cold Storage

While cold can be produced striftening ways in the compression, the absorption, and the sir expansion events are of commercial importance and they remain the compression. The theory of operation of all three is comparatively simple, atthough in order it obtain the highest efficiency onch apparatuse is at times somewhat complicated. In all three types a substance known as a heat cerrier, taking up heat at a low temperature in the cooler and discharging it infor unmine water. In order that the refrigerant may perform this function, work must be done. The refrigerant most generally used in the compression system is analytican earlier under all the compression system is analytican ends, although cerbon dioxide and subject doxide are

It will be seen from Fig. 1, a diagrammatic view, that the compression system causals of four main parts, a compressor, a condenser, an expansion valve, and an evaporation or refrizerator coil. The compressor, in effect, is a best pump, as it enables the retrigerant to perform its function as the heat carrier. In operation, it pumps ammonia wapor out or the retrigerator coil and forces it under high pressure into the condenser, where it liquefies, due to the high pressure maintained therein, unasily about 175 pounds for emmonia, and to tecoding effect of the water fowling over the pipe coil. The heat removed from the amounta in the condenser is of two kinds; that its, sensible heat or heat put in during compression (all games generate heat when compressed) and the latent theat which the ammonia gives up in peaking from the gameons the liquid state. The liquid ammonia then passes through the expansion valve into the refrigerator coil where it again evaporates or boths by reason of the heat from the substance to be cooled. As fait as the vapor is given off it is pumped out by the compressor, and it is essential that the pressures be kept comparatively use, for the holding temperature of all liquids depends upon the pressure. Under 15 pounds pressure ammonia belies at zero Fahr.

It will be noted that the cooling effected is due to the general heat absorbed in passing from the liquid to the general state, and not to the expansion of the ammonia gas. The latest heat of ammonia is very marked one opened of liquid ammonia e-vapivating at 15 pound-pressure, is sufficient to convert over four pounds of some pressure of the pounds of the pressure of

It is absolutely essential that the animula be in the liquid form as it enters the cooling cell, for otherwise no cooling will be effected. The compression system was invested by William Cullen, an American, who took out an English patent in 1755. This system did not come into general use, however, until about 1870, when ammonfa was introduced as the refrigerant.

ammonia was introduced as the refrigerant.

The absorption system was invented by Ferdinand Carre, of Paris, about 1890. In this system the compressor is replaced by a vessel partially filled with water. When cold the water readily absorbe all the vapor from the liquid ammonia evaporating in the refrigerator coll and forms the ordinary strong aqua ammonia. This aqua is then heated and the ammonia gas in dry or anhistrons condition is driven off under high pressure into the condenser, where it is cooled and liquefied in the same manner us in the compression system. In this simple form the machine is intermittent in its cooling, but by undar a separate absorber and a pump to cause the liquid to circulate through the boller and the absorber, the cooling operation can be made continuous. Absorption machines are still extended in the condense of the control of the control of the continuous.

Not more than the companion medithe was more generally used than elliner of the two others mentioned alove. It was havented by Dr. Gorrie of Apinchicola, Florida, in 1845, and was used for ranking to. The machines have the same elements as the compression matchine, except that the expansion valve is replaced by an expansion engine. As the air is not liqueled in the condenser it would not effect any appreciable couling if allowed to expand freety through an expansion valve, but if allowed to expand ganjust a movable placeman of the condenser it would not effect any appreciable could not so the condenser it would not effect any appreciable could not so the companion of the condense is not contained to the companion of the compani

While the artificial refrigeration industry is one of comparatively recent development, its growth has been very rapid, and it now plays a very important part in the conservation and distribution of our food supply. The improvements in retrigerating apparatus and methods in the last decade have been numerous and important. These changes generally relate to improve ments made in the construction and operation of the

various integral parts rather than to the machines and processes as a whole, and to the extension of the industry to new fields.

Often in cold storage systems II is desirable to main-

Often in cold storings systems II is destrable to mathem different temperatures in various compariments; also in ice making the temperature of the fore cooler should be higher than that multishined in the freezing tank. As the temperature in a refrigerating odd is dependent upon the lack or suction pressure, it is obvious that it would be difficult to maintain such difference in temperature by an ordinary compressor. To overcome such difficults, the compressor shown in Fig. 1 was devised. During the first part of the auction stroke of

this compressor, low pressure gas is drawn in from the freeding col, and when the piston is near the end of its stroke, a part is uncovered, permitting gas of a higher pressure to rish in from the fore cooler. In this way the eythind becomes filled with gas of the higher pressure maintained in the fore cooler and on the retring stroke the part is quickly covered; the gas is conpressed and driven into the condenser. As the refrigering capacity of a compressor is proportional to the absolute back pressure at which it operates, it is obvious that this multiple effect arrangement greatly increases the capacity of the compressor, and especially as where carbon dlackle is used as the refrigerent

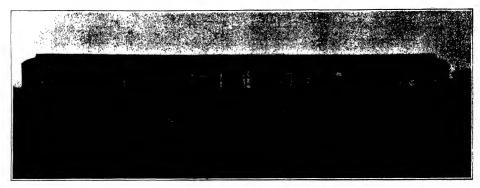
sat where carron maxime is used as the refrigering.
The quadruple acting compressor shown in Fig. 2, is
a more recent product. About milway of the bare of
the cylinder by placed a partition which also knows
discharge valves. The two plotons have bollow platon
rods provided with check valves for the admission nor
despined to keep down the heave for the admission of
gas to two of the compression squees. This feature is
designed to keep down the heart generated during compression. It is obvious that this compresso has a
large expactly for its slow.

It is probable that less effort has been made to harprove the condenser than any other me part of the
friberating machine. For many years condensers were
generally so constructed that the hol gas entered at the
top of the coll and the liquid condensed was drawn off
at the bottom. Heccurity, however, an improved form
shown in Fig. 3 was hirtofuced, in which the hol gas
was made to enter at the bottom of the coll instead of
the top. This simple change made it possible to reduce
the size of the condenser one half or more and still
obtain more satisfactory results than with the old form.
This is due to the fact that the transfer of heat from
the hot refrigerant holds the coll to the condensing
water is about four then as rapid when the refrieerant

(Continued on page 272)

# A Car Designed for the New Subway

Providing 42 Per Cent More Seats and 100 Per Cent More Standing Room Per Passenger



Full-size model in wood of new steel subway car for New York Municipal Railway Company

I N rapid transit service, the number of passengers that can be carried in a given time over a given length of road is determined, not so much by the speed of the trains between stations as it is by the time occupied at the stations in discharging and taking on pas sengers. In most large cities, the rapid transit bassenger asks first that he be taken to his destination as quickly as possible, second: that he be given a seat.

On the present subway of this city, as operated by the Interborough Company, the express platforms are about five hundred feet in length This dimension determines the number of cars that can be run in a single train, and the express trains as now made un consist of ten cars which, if louded to their maximum stilling and standing capacity, during the rush hours can each necommodate twelve hun-dred people—this, be it remembered, representing the maximum possible accom-modation when there is heavy congestion of trof-fic. Of the hundred and twenty passengers crowded into each cur, forts four six standing

The New York Muni cipal Railway, which will operate a part of the new dual system that is under

construction, has designed a new car, in which they have sought to provide, on the basis of 1,200 people per train, a larger seating capacity, and a less crowded standing space for those who cannot secure seats. Also, by making a better distribution of the three cutrances to each car, they have facilitated the toading and unloading of passengers, and so have cut down the time

The new car will, of course, be built entirely of steel; but to demonstrate to the Public Service (

and to those who are interested in the proble erni external and interior appearance of the car, the comfort and convenience of the seating arrangements. and the freedom of ingress and egress, the company have built at their yards in Brooklyn a full-size i car, of which we present the accompanying illustration

It will be noticed at once that the car is very much larger than those in use in the present subway. The end platforms—which should have been abolished from

Interior of car, showing seating and wide standing snaces.

subway and elevated service long ago as an obsolete survival of the early days of raitroading—is omitted, and the whote 67-foot length of the car is available for seating accommodations. The width of the car is 10 fect. As compared with the present subway cars, the new model is 15 feet 7 inches longer and 15½ inches wider. Each train will be made up of eight cars as st ten in the Interborough trains, and the total length of the eight-car train will be 538 feet 4 inches, agalust 513 feet 5 inches. The total space in

feet as against 3.702 square feet in the ten-car train.

In the Interborough cars there are a center door, and two end doors on the platforms; on the new car there is a center door, and a door at each side of it so spaced as to give the minimum amount of move for a passenger in passing from his seat to the door or vice versa. The guard stands in the center of the car on the side opposite the station platform. He stands on a platform suffi-

clently elevated to enable him to see clearly each set of doors, which he opens and shuts by pressing electric buttons that operate nn electro-pneumatic sys-tem. To prevent the motorman (every car is a motrain until every door is shut, the door-closing mechanism is so connected, electrically, with the controlling lever under the motorman's hand, that he cannot start the train until the last door in the train is closed, and an electric light signal in the cab has given him notification.

We draw attention to the accompanying table com-paring the proposed car with the present subway car. The most significant relative seating and stand-

ing capacity, from which it will be seen that the stand-ing and seating conditions are vastly improved.

COMPARISON OF SEATING AND STANDING CAPACITY ON A BASIS OF 1,200 PEOPLE PER TRAIN.

N Y. Mun. Ry. Car 150 78 72 370 kg ft 2 1/2 sq. ft 440 out of 1,200

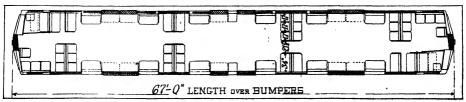


Diagram showing plan of seating and distribution of d

# A New Mail Carrying Railway

A Parcels Post Tunnel



View of the inner circle, showing the tube at the far side and end, with a two hundred and twenty foot trestle on the right. The trestle represents a twenty per cent grade.

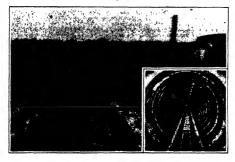
THE advent of the parcels post has created a demand for some means whereby large numbers of parcels may be transported by a more expedition less easily interrupted system than the less cashly interrupted system than the horse-drawn vehicles or motor cars at present rolled upon. The Government's interest in the matter was shown by the appointment of a commission recently to investigate the feasibility and practicability of an underground tunnel between the new post office, located at the Pennsylvania Raifroad station, and the Grand Central terminal in New York city, a tunnel large enough to transport mail in sacks. In five of our big cities, namely, York, Chicago, Philadelphia, Boston, and St. Louis, a large part of the first-class mull is transported between the post office and branch stations and railway stations through underground pneumati-These tubes are eight inches in diameter, and the letters, tied up in small bundles, are dispatched in steel carriers which fit like a piston in the tube, and follow one another in rapid succes while these tubes are adequate enough for ordinary mail, they cannot handle the larger backages which are sent by parcels or large sucks of letters. Ol a mail-carrying system is demanded which will fulfill these requirements. Hardly had the parcels post been definitely established when several companies immediately entered the field with proposals to build tunnels which would handle the bulky mail matter of the parcels post.

One of these systems was described in SCIENTIFIC AMERICAN of January 4th, 1913. Another has been experimentally tried out at Paterson, New Jersey.

The Paterson system represents about seven years of continuous effort to produce an electric carrier system of commercial form. As it now stands it seems adapted not only to propel parcel conveyers, but also elevators, excitators, moring alsewalks and even the rolling stock of standard gage refireds. A 14-fact model was installed some time ago at the Bush Terminal. It attracted much flowrable comment at the time. It was not, however, a full-sized commercial plant, complete with terminal buildings, switches, strategy and strapping devices, and the law, which the strapping devices, and the law, which

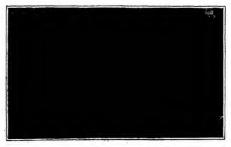
And the second

Bally Windows .



The structure viewed from the top of the treatle showing the terminal building in the distance.

The sumii insert is an inside view of the open structure, showing the fixed motor member between rails, the other motor member being attached beneath the car. There are two conducting rails, for two phases of the current, the third phase being grounder.



The car used in experiments

The workmen were photographed inside the car to show the relative sizes of the parts. All the car space is available for freight. The cars weigh 1,200 pounds and take the grade easily with a then per cust slip from synchroneus speed under a load of 1,500 pounds. would afford a real demonstration under actual conditions to business men and government officials. Such a plant, however, is now to be seen at Paterson, New Jersey.

At the Paterson plant 36-inch tubes have been built in these tubes cars run on rule and are driven by alternating current supplied by combacting rule. The cars are provelled by magnetic push or pul, without wheel traction. In other words, they are swent along by the progressive magnetic field produced by the reaction between a flut motor member, at tached to the bottom of the car, and an elongated motor member affixed to the track between the rule. Both members of the motor are made of infinished from The fronts of the car member contain once dreat wire windows, those of the track member, closed circuit windings of the squirre (age (1))e

Since there is no rotary motor, no gentings, no armature, no commutator, the cars require neither offing nor attendance Hence the cost of operation and maintennace is reduced to a comparatively very small figure

Regardless of their number, the enra nar instantly obsellent to central control. They can be started, specified up or slowed down, stopped or reversed by pressing the buttons within courter the current supplied through the two feeder ralls, without shock to the cars, contents or track. At any predetermined point, the ears may be switched automatically from the until line to branch lines, or from branch lines to the math line, without affecting the movement of ears which are tunning before or behind the shunted cars.

The longer the line, the more rapid, reliatio, economiest and efficient will be the operation. Write it has been estimated that a system constructed on the dimensions of the Paterson plant, possesses, currying enactly sufficient to transport will the mains and express matter meeting between any parts of London, Parts or New York, it may be designed on any diameter necessary to handle small east the stock of the paterson of the paterson of maintain and the towards of the paterson of the

A patented signal system indicates the location of the cars in transit, the signals

(Concluded on page 276.)

## The Heavens in October

#### The Newly Discovered Comets and Their Orbits

By Henry Norris Russell, Ph.D.

A FTER a considerable interval, during which no comets appeared, two have been found within a few days of one another.

The first was discovered by the liev, J. II Meteuk, as Nouth Here, Vermout, on the night of September 1st—cridently while this well known and successful astronomer was endoving his vacation. It appeared to be of the ninth magnitude, and showed a slow north-the ore; motion. The discovery was, as small, telegraphed to the Harvard, whence the news was spread to astronomers generally.

A photograph taken at the Yerkew Observatory by Prof. Harnard, on September 5th, with four lours' oxposaire, showed the comet as a runad, condensed nebulostly without sux tall. A providenial cribit of this comet, based on observa-

A provisional orbit of this comet, based on observations on September 2nd, 3rd and 4th, shows that it was just approaching perthelion when discovered, and reached that joint in this orbit on September 14th, at a distance of 122 million mile from the Sun. The plane of its orbit is inclined about 37 degrees to that of the celliptic, and its motion around the Sun is retrograde, that is, in the opposite direction to that of the Earth

The second conet was discovered by the Russian acronomes. Neulini, four days after the first I's orbit ins also been calculated, and it appears that it, too, was just approaching perhelion when discovered, and will be nearest the Nin on October 3rd. The parabolic orbit first calculated gave the rather large perhelion orbit first calculated gave the rather large perhelion orbit first calculated gave the rather large perhelion orbit first calculated gave the same first in the observations can only be satisfactorily represented on the assumption that the orbit is an eilligae, with a period not exceeding 18 years, in which case the perhelion distance comes out 151 million miles As the inclination of the orbit is only 20 degrees, and the comer's motion is "direct," it is not milkely that it may prove to line a short period, for the orbits of all the known short-period comets show these characteristies. This cannot be settled, however, until the comet has been under observation for a month or two

As is usually the case, the ephemerides of the camer's bortons which have so far been published "trun out" before the date at which these words will be published. In the case of Neujanin's comet, whose apparent motion is nearly uniform, the ephemeric can easily enough be extended, showing that on October 1st it will be nearly 10.28 hours 35 minutes right ascension, and 9 degrees north declination, and will be moving 45 seconds westward and 28 minutes northward per day. This comet should then be a little brighter than at the time of discovery, but as it was then of magnitude 11.5 it will not be at all considerance, even in a tele-

cope of moderate size

Metcuif's count has been rapidly approaching the Earth during the last weeks, and its apparent motion in the beavens has been at a steadily increasing This makes it more difficult to ex trapolate its position beyond the end of the published ephemeris; but it can at least be said that at the beginning of Oc-tober the comet will be in Cephens, in about I bour 20 minutes right ascension and 79 degrees north declination. On October 3rd It should be close to y Cephel, and moving to the illication of a Cephel, at the rate of fully 2 degrees a day. this time it will be about as near the Earth as it will ever get—some 54 milition miles away-and should oppear a little fainter time the seventh magnitude, conspterious in a small telescope, and visible with a good field-glass

The two accompanying sketches show the orbits of these comes. In the case of Nendanha's counst, the plane of the orbit is mear remain to that of the Earth's orbit to permit both to be drawn "in plan" without serious error. If the Earth's orbit is supposed to be exactly in the plane of the super life comes orbit must be hong-lised to rise slightly above this at the upper part of the figure, and to poss island to provide the profit of the figure, and to poss latent the state of the figure of the figure of the possible of the Earth and counted in intervals of a month are shown connected by dotped lines. At the last

hite represented (January 22nd, 1914) the distance of the contet above the plane of the paper is about haif the radius of the Earth's orbit. It will easily be seen how the comet will remain visible for several months, at first remaining in almost the same longitude (referred



Orbit of Metcalf's comet.



Orbit of Neujmin's comet.

to the ecliptic), but slowly moving northward in the sky, and varying very little in distance from the Earth or in brightness; and that later it will retorgade in lougitude, recede from the Earth, and grow father, but will remain whible in the evening sky for many months. In the case of Metcail's counct, the inclination of the orbit is much greater, and one diagram shows the councies orbit in plan, but the Earth's orbit is seen obliquely and foreshortened. From a circle's into 'asallipse whose upper side man't be supposed to be 'bihind the plans of the paper. Here, on account of biretrograde motion of the count, the threusestances are very different. The two looks approach mas essection very rapidly during September, pass one sanction eatily in October, and recode from one another with almost equal speed, so that by Documber Lat they will be about 150 million miles spart.

The conset apparent motion, in consequence of this, was also when first discovered, nince it was coming mently straight toward us; increased very ragidity, reaching a maximum seril; in October, and will then quickly fall off again, with its brightness varies to just the same way. It may finally be observed that both of these comeds have happened to present themselves under almost the most tavership conditions for observation, passing the points where their orbit comes generate to that of the Zarth at amost the same time that the Zarth at content of the conditions of the conditions

If Nonjmin's conset had come to perihelion six months earlier or later, when the Earth was on the opposite side of its orbit, it would have been fully 200 million miles from the Earth, and almost behind the Sun, and it would have almost certainly escaped discovery. Metcalf's conset, on account of its retrograde motion, would have stood a better chance of discovery, but would not have been nearly as bright as it will actually appear.

Our map shows the aspect of the evening sities so well that little description is necessary. The Great Bear is low on the northern horizon, with the Dragon and the Little Bear above. Berquies is setting in the northest, with tyra and Cypmus at a higher sittlede, and Aquila farther to the south. Peganus is just south of the senith. Below it, Erdanus, Cetna, Aquarius and Capricornus fill a wast duil region, sweeping right across the beavens from east to week, in which the only conspicuous stars are \$\phi\$ Cetl and (farther south) Fumsi-haut in the Southern Fish.

The eastern sky is far more brilliant. Arise and Tanus are high above the horizon, when Orion is rising, and in the northeast we find Andromeda close to the senith, then Perseus and Auriga, while Gemini is beginning to appear.

Metcalfs comet le in Cepheus, above the Pole, and Neumin's is a little south of the lower edge of the great square of Pegasus, so that both are excellently placed for observation.

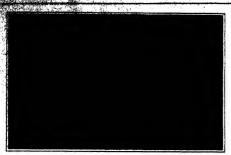
The Planets.

Mercury is an evening star throughout October, but is very far south, and hard to see. He may perhaps be picked up near the and of the month, when he sets about 5:50 P. M., but even this is only 55 minutes after sunset. Venus is a morning star in Leo and Virgo, rising at 3:20 A. M. on the

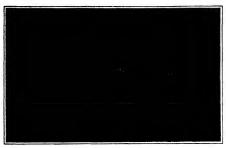
and Virgo, rising at 3 220 A. M. on the lat and 4 236 on the 31st. The change in her appearance is mainly due to her southward motion, but partly to her diminished distance from the Sun. Telescopically, she appears gibbons, like the Moon three or four days from the full. Mars is in Gemini, moving slowly eastward, and steedily growing brighter. He is in quadrature with the Sun on the 2nd, and crosses the meridian at 6 A. M. but being so far north her lesse long before midnight; in fact, by half-past 10. At the end of the month he rises shout 0 230, and is conspicuous in the latter part of the section, looking as bright as Capella or Saturn. Jupiter 3º evening star in Sagittarias and passes through quadrature on the 2nd. Seing very far south, he sets at 10:30 P. M. at the beginning of the month and 8:50 at its close. Saturn is in the eastern part of Taurus, and rises about 8:15 P. M. in the middle of the month. Uranux is in Capellacian, and crosses the meridian about 7 P. M. Neptune is on the boxeler of Geminia and Cancer, and souths about 6:20 A. M. The Moon is in the first quarter at 6 P. M. on the 28th, and fatthest away on the 12th. Sike is in continued, and new at 10 A. M. on the 28th, and fatthest away on the 12th. Sike is in continued the way on the 12th. Sike is in continued the way on the 12th. Sike is in continued the way on the 12th. Sike is in continued the way on the 12th. Sike is in continued the way on the 12th. Sike is in continued the way on the 12th. Sike is in continued the way on the 12th. Sike is in continued the way on the 12th. Sike is in continued the way on the 12th. Sike is in continued the way on the 12th. Sike is in continued the way on the 12th. Sike is in continued to way of the 12th of Marca, 24ct; Negation, 22dei; Vesson, 27th; and Sikeryan, 27th



NIGHT SKY: OCTOBER-AND NOVEMBER.







One of the newer American cyclecars.

# Cyclecars—American and Foreign

#### An Automobile That Developed from the Motorcycle

IN England, and, to a recommendation a lively intorest in the "cyclecar." These little vehicles are neither real automobiles in the usual sense of the word nor matercycles. Americans, too, have developed cycle-cars of their own, or vehicles so closely akin to the typical cyclecur that they must be classed as such.

In the broadest possible sense, the American cycle-cars might be classed as imitations of the foreign style. Actually, however, they are not imitations. They are original vehicles, brought out to fill in America the place that is filled shroad by the foreign cycleor. Hence, it was to be expected, in foreseing their uitimate development, that there would be vital differbetween the American and the foreign cars

Undoubtedly it was the motorcycle that furnished the inspiration for the cyclecar. Most mortorcycles will carry two persons, but hardly in comfort. Hence, to carry two persons in comfort required some other arrangement, and because of the difficulty of construct ing side cars that will stand up and that look well and afford real protection to the second passenger, as well as to the first, the cyclecar was naturally evolved.

And, quite as naturally, the typical foreign cyclecar is characteristic of the latest motorcycle whence it sprang. It is true that some of the foreign so-called cyclecars are perilously like full-fledged automobiles in

It is therefore apparent that there are few restrictions to hind the designer of a cyclecar, and yet the restrictions are sufficient to make necessary the elimination of parts that characterize the full-sized automobile. Thus, the typical foreign cyclecar is minus the usual differential mechanism and live rear axle, and as a rule has no change genr sel. In these two respects the American cyclecar, or the American vehicle that comes er to being a cyclecur as is possible with construction, is quite different from its foreign cousin In every one of four American cyclecars on the market at present there is a change goar set, shaft drive, live rear axle and a differential mechanism, all of which parts belong to the ordinary motor car. Hence, where as the foreign cyclecar is a thing apart, the American cyclecar is nothing more or less than a ministure edition of a full-sized automobile.

In the design of the typical foreign cyclecur the motorevole motor, designed and built for the motorcycle.

is adopted in toto without any excuse and with less As a rule, it is a twin-cylinder air-cooled motor. In every one of the four American cyclecars to which we have referred, however, the motor is a fourcylinder machine and is cooled by water. All of them, except one, are block-cast machines with puppor-valves, and the one exception has a piston-valve motor. Among nty-two makes of well known foreign cyclecurs, on the other hand, only two have four-cylinder, waterthe other hand, only two have four-cylinder, water-cooled motors, whereas eleven have two-cylinder, and cooled motors, two have single-cylinder, air-cooled mo-tors, and seven have two-cylinder water-cooled motors. The resemblance to motorcycle practice is unmistak-

In the transmission elements of the twenty-two for-eign cyclecars, the resemblance to motorcycle constru-tion is even more apparent. Seven of them are driven by means of belts to the rear wheels; of these seven, six have chain transmis tershaft; three of them are driven directly by chains and the remainder have shaft drive to either bevel or worm gearing on the rear axle. In the four American evelecars which we have studied we find that set to a differential-bevel driven rear axle. The American cars, therefore, are much more clo their larger brothers of the automobile world linn are

If we examine the sixteen cyclecars representing England, France and Germany that ran in the Auto-mobile Club of France's Grand Prix race for cyclecars a few weeks since we discover that no less than nine of them were driven by belt, and of these nine six had chain drive to a countershaft; the remaining three out of the nine had, in two cases, shaft drive to the countershaft, and in the third case—the "Bedelia"—the drive was direct from the engine to the road who by belt. These little machines are very obviously nothing more than enlarged motorcycles.

Still further examination of these foreign cyclecars shows that in a great many cases the steering gear consists of nothing more complicated than a couple of steel cables running over a drum on the lower end of the steering column. Six of the cyclecars in the Grand Prix race were so controlled. American practice, however, prescribes the regulation worm and sector gear found on full-sized automobiles. Again, the trend, or

wheel track of the typical foreign cyclecur is untrower than the standard fifty-six inches milered to by the makers of large motor curs. The trend of two of the American cyclecurs mensures thirly seven and forty-four inches, respectively; of the other two, fifty six inches The average wheelbase of the foreign cyclecus is proximately eighty-eight inches, and the average wheelbase of the four American cyclecars is almost-four inches, the average weight of the foreign cyclecar is a little over six hundred and ten pounds, and the aver age weight of the four American cars is nearer to eight hundred rounds

Before going any further it is necessary to call attention to the fact. If that fact has not already been disd, that the four American curs which have been partially described, are not, strictly speaking, cyclecurs,

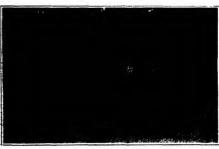
But they are small curs -very small ones and they are the neurest upproach to the true exclosur that has us yet been produced for the market in America sequently, as such, they are interesting

If they are considered as real cyclecars, they are easily the superior of the average foreign cyclecar, which in the hugange of a well known British engineer the recently paid a visit to the United States, "Is poorly designed and improperly constructed with too little attention puld to detail and to the strength of parts."

Just how for short of their ideals foreign manufacof cyclecurs have fatten is well indicated by the list prices that are quoted for these little vehicles spite the light construction, the adoption of existing motors and the incorporation of motorcycle features, all of which logically should be expected to lower production cost und hence selling price, the foreign £100 evelecar is still practiculty miknown; and it was the cyclecar that designers first sought, and, be it added, still are seeking

In the mean time, American designers have be themselves and netually have produced the \$500 cyclecar In two cases that flare includes a reasonable amount of equipment, which is never included under foreign selling prices. Starting virtually at the bottom, with little but the germ of the cyclecar idea, American designers have cast out motorcycle practice as unsultable and have built their cyclecars from the bottom up. As a result they may be styled, without any fear of contradiction, able tittle cars capable of standing up under hard service.





A French cyclecar of the tandem type.

Interesting Uses of Paper

I't is a question whether there is an industry in this country more interesting than the manufacture of wood pulp and its many uses. A number of countri have contended for the honor of enjoying greatest prog ress in the making of various articles from wood pulp. Germany, France, Eugland, and the United States are the principal chalmants. Of the four countries named Germany would seem to have the balance of testimony on its side. Noveltles made from paper pulp are by no means of rare occurrence in the 1-nited States, and are now so multifurious as to defy enumeration

At first, wood putp was used entirely to making pape but to-day it is employed for menifold purposes use bids fair to be birge for moldings, friction clutche helt-pulleys, genr wheels, burrels (reinforced with wire), tubs, palls, washboards, water pipes, conduits, caskets, buth tubs, curriage bodies, floor covering, electric insulators, umbrella stands, furniture, imitation of leather, cloth, and silk. Clearly the employment of wood pulp is practically unlimited.

The great consumers of wood pulp to-day are the paper manufacturers who use nearly 90 per cent of the entire production. According to the Bureau of Statisties, there are nt present about 250 mills which manufacture wood pulp in this country. The enpacity of these mills is over 2.500,000 tons of pulp manually, valued at more than \$32,000,000. In addition to this amount, more than 400,000 tons are imported from Canada and various countries of Europe. The value of material received from abroad in 1911 was nearly \$15,000,000 These flures show an increase in the business of over five hundred per cent in the past ter years, and the same time in the future promises even

By proper treatment wood putp can be made perfeetly translucent, unbreakable, and indifferent to at-mospheric changes. While it has not yet been made transparent, it admits abandant, soft, pleasant light, where it is used in place of window panes. Paper pulp is now made up into boards that can be used in a variety of places to supplant the use of wood ease of molding into any desired shape and the saving in weight make the use of this product valuable in struction of the ornamentation of ships such as the facing and frames of doors, walnesotings, panels, etc. This material is also used in making imitation tiling for the walls of bathrooms, the forming of closet seatetc. In fact, entire houses, garages, hencoops, etc., have successfully been made of this paper board. When properly impregnated it is impervious to moisture and forms a good non-conductor of heat. Another product used in house construction is roofing tiles, which are now gaining a reputation for their smeerior qualities over other rooting uniterial in the market. The application of wood pulp for house building is not new, and has met with complete success. In Europe there are rms which build houses almost entirely of water priofed postebourd. Wood pulp is likewise used in wood for making furniture, tables and fold ing chairs, their chief advantages being lightness

ing charts, their circum total anges being ingamess.

Paper serves are now being unde which give therough satisfaction. The principle of having wood against wood is a point in favor of wood servess. They are used for ornameural work, where it is destrable to give the heads of the screws the same color and grain A varulsh on top of this udds to the offect and protects the dye, as it penetrates the fiber and acts as a preservative—It has been estimated that these wood buln screws can be made so cheaply as to compete successfully with screws and log bolts of other Paper screws can be readily removed even after they have been in place for many years. The screw are cast and the thread is cut as in the common wood screws. The drive screw is east with attenuated through curves, so that when delven it revolves and finds a firm footing in the wood. It can be driven only into soft wood after a hole is first started

Another economic application of paper which is gaining in importance is the making of cord and rope. These new ropes are spin and twisted out of the thin threads which are made from wood pulp. This in-dustry has attained considerable importance in Europe It is said that these ligneous fiber ropes are used m or less extensively in the foundries of Germany. fine threads which make no these ropes are made by forcing the chemically treated wood pulp or cellulthrough very fine tubes into running water, in which they harden. After they are dry they are perfectly pliable and somewhat clostic, and may be spun or twisted into any form whatsoever. These minute elongated threads are caught up as they are forced through the fine tubes and spun into ordinary slikes threads, which are woven into a fabric resembling

A French inventor discovered that paper may be eninto narrow strips several millimeters wide and that after these have been steeped in certain chemicals which give them tenecity and ducillity, they may be rolled and twisted into threads, which may be worked

up into fabrics of various kinds and put to a great variety of uses. Another French chemist has discovered a way to make such fabrics, as well as ordinary paper. erproof, and a German inventor has p quality of thin paper practically fireproof.

Such discoveries have ied to the making of hats, incounts, corsets, vests, underwear, collars, ties, secks, shoes and even overshoes. In the Chicage City Hos-pital experiments have been made in furnishing the patients with garments made of a soft tough paper These garments are light and airy. After use each garment is destroyed and lius all danger of infection The paper raincoat is a nevelty. made of a light-weight waterproof paper. The garment comes folded in a very small package which can easily be put into a lady's handbag. The package is ed and the coat unfoided as occasion de article is so cheap that it can be thrown away after use. One inventor has designed a paper sock for use in the army. The sock covers only the parts of the foot that are usually chafed by the shoe. This insures light weight and adds greatly to the comfort of the

Paper may even be so treated as to make it suitable or sails for light vessels. Such sails are not woren for sails for light ves from sirands or threads, but are made up from com d sheets of paper, which are made in th way, the pulp having been thoroughly mixed with cer-tain chemicals and other substances. These paper sails are inexpensive compared with good canvas stock or

But hy far the greatest progress has been made in the application of this material to sanitary and domes-tic uses. The realization by the public generally of term theory of disease has do e more to multiply s of paper than any other factor It has led to the introduction of the various individual recentacles and containers that now appear upon the market. Notable among these is the individual drinking cun. The extent to which those cups are utilized can be com-prehended when it is stated that the returns routized from the sale of penny cups from slot machines in the Pennsylvania State capitol indiding alone amounted to \$113 during the past year

In modern sanitation and the treatment of diseases the various paper receptacles and protective appliances have proven of inestimable value. In some of the west-ern States, notably California and Colorado, which furd a climate especially beneficial in the treat tuberculosis, it has become imperative for all public urities to be thoroughly protected. Otherwise cen-tugious diseases will be spread instead of checked. Some of the most dangerous articles are the telephone mouthpiece, the common towel, and the public drink ing cup. Paper has come to the rescue and supplied towels and drinking cups that are to be discarded after

Milk bottles of paper will soon be in extensive use. They are cheap and saultary and the troublesome washing and collection of the empty bottles is obvinted. The danger of breakage is also eliminated. A very recent improvement in paper milk bottles appears in a patent to A G. Brant (No 1,067,237). This is a bottle having a narrow strip of transparent material running the full length of the side. This allows the buyer to the level of the cream on the milk or the level of the liquid in the interior, and enables him to whether there is any sediment in the bottom of the

Paper recentacles of all kinds are now on the market. These are especially valuable in the packing and shipping of foodstuffs. The manufacture of water- and gream-proof paper has recently been introduced and is especially useful in this connection. Eggs are best packed in paper receptacles, and a recent practice has urisen of shipping eggs by parcels post in a special type of paper container Ice cream is at present sold in small quantities, packed in paper receptacies, and it has become a practice for some of the progressive dealers to furnish therewith cheap paper spoons that cost very little.

packing of loayes of bread in individual wrag pers is another advance in the handling of foodstuffs, an advance which not only insures cleanliness, but also prevents the entry and escape of moisture and preserves the freshness of the loaf.

One inventor, J W. Welss (No. 1,063,845), makes a collapsible flox of paper with a reinforced part along the sides or corners. Usually collapsible paper boxes are very flimsy, but this box is strong enough to bear the weight of a full-grown man. The immensity of the paper box industry may be restized when it is stated that in one industry alone—the manufacture of pens pencils, and erasers—over four thousand different sizes

pencies, and erasers—over four thousand different sizes and sinapse of boxes are required. But the use of paper in this country caused approach the many uses to which it is put in Japac, which is virtually a paper kingdom. The houses are made of virtually a paper kingdom. The houses are made of the light frames of hamboo covered with paper. Almost overything that the Americans make of wood or leather

in there made of paper. The ed rainy or snowy weather made of a very tengh er-of waterproof paper. These mantles can be used of thoughly for about a year and cost only 18 cents. ? consequence for a year and cost only 18 forms. The less merchants use raper suchs, the paper having been chanced by a vegetable soid. These suchs are used over and over again, and it is said to be a common chiag to see sector that are eight or ten years old and have paper patches on them. The

SEVENDERATE RANALOW GRISSERENAE

#### The Wreck of the First German Naval Airship "L 1" By Carl Dienath

THE Zeppelin "L 1," the first attempt to adapt a Tairigible I dirigible to regular sea service with the navy, foundered in a heavy storm on the North Sea with great less of life, twenty nautical miles to the northwest of Heligoland, late in the afternoon of Sep 9th. It left the air harbor of Hamburg at 1:30 P. M. right sunshine to take part in the night man of the navy, with supplies and a crew for a thirty-house The ship had been in service for nearly one year, making more frequent trips than any airship of the army, and it had been found desirable to equip il with a heavier and more powerful wireless telegraph, stronger electric searchlight (big are lamp worked by heavy storage batteries), with a sound-proof cabin for the wireless apparatus, with an upper platform accom modating two machine guns in place of one; all being an additional load, for which the ship's original carrying capacity was not quile sufficient. It meant that at the start of a long trip with great quantities of supplies, and with a numerous crew, on duty in two shifts or "watches," the surplus lift for emergencies was smaller than originally provided for. The ship had en built with a greater displacement than the old type for over-sen use. Its unfortunate commander, who, a naval captula, did not survive his ship, is known to have privately stated, from experience, that the mixes had made it too heavy, and that it might plunge down some day.

s of the naval authorities to test and develop military equipment, and the fact that even so, only the extra amount of buoyancy provided for oversea use had been sacrificed, and what on a smaller "overland" dirigible would have appeared a fair amount allast could still be carried, is responsible for this peculiar situation, which, through an unusual combina-

On the day of the wreck the "L1" started fully influted, but in bright supshine, losing immediately gas by expansion As soon as the sea was reached the sun disappeared and it began to rain The gas shrank and the hull became heavy with moisture.

id lieligoland the nirship was struck by the first real sea storm ever encountered by any niveraft was one of the typical flerce storms on the North Sea, which at this time of the year, according to Capt. which at this time of the year, according to Capt. Blew of the alrebip "Weterla Ludse," formerly a navil officer and very familiar with the German Ocean, mostly prevail at the latitude of Norwae, but may with-out warning extend farther south. The rain squali-lecame of truplent violence and vertical gasts threw the alrebit up, and down nearly a thousand feet at a . The cooling of the gas became so intense, and the so heavy with the water streaming from its sid not to mention the downward momentum of the imping-ing tropical rain, that Dr. Eckener, the experienced pilot of Zeppelin dirigibles, figures a loss of bnovancy that meant the sacrifice not only of all the avai bailast-the gasoline, unfortunately, could not be quickly osinst—the gasonine, unfortunately, could not be quickly discharged—but also all the aeropiane lift of the inil and the propellers. This left nothing with which to counteract the vertical gusts. When it was tried to "beach" the sirship by running at top speed before the wind, the effect of the vertical gusts (according to Cant. Biew's experience in running before the wine creased so much that the ship became their toy. With the heavy storage battery screwed to the front car, and very probably a rush of the crew at the last moment servers, most of which were kept the life-ore the vertical radder could not prevent it quickly enough from siriking the raging sea head on while traveling at a terrific speed, thus burying and crushing the bows and stunning every man in front. The hull crashed flown on the car. The waves made such short work of the buil that every single ses compartment was soon torn by the broken aluminium frame. The wreckage at down in forty minutes. The storm, which lasted all night, was so had that the fishing steamer ran great risk trying to save some of the crew.

The new naval airship just completed is provided not

any new may a arrang pass composed as provided not call with great surglus life and much higher speed and controlling power, but is also stouter and shorter, thus expressing proportionally less entrace to the rain. It is needless to say that any other type of airwark tweld have shared the fate of "L1" under like conditions.

Jan Control of the Care

An Emergency Dark Room

THE WAR DE STANKING THE PROPERTY OF THE PARTY OF THE PART

"DARK BOOM" which has once plates in the holders, and which may serve again, is herewith illustrated. The arms of the operator were thrust through the alcoves of the largest available rain-cost, from the outer ends inward; then the neck of the cost was drawn closely around his body white the edges and bottom were held under his feet and lega. Though such a dark room is adapted, literally, to serve only on a plach" if gives sufficient room to empty and well one of the reality of the cost of the cost was drawn closely around his bottom were held under his feet and lega. Though such a dark room is adapted, literally, to serve only on a plach" if gives sufficient room to empty and well one which his reality of the cost o

#### The Largest Ice Cave in the World

A FEW years ago some members of the Austrian Speleological Society discovered in the lackatefu mountains some caverns which are among the largest in Europe. One of these grottoes, the lougitudinal axis of which is fully 6,809 feet long, moreover turned out to offer additional interest by the truly enormous ice masses and was found to be the largest known tee cave in the world.

Though a scorching ann may be burning outside on the bare mountain rock, there is always an key wind blowing through this underworld, freeding everything within the reach. Only sometimes, when the outside temperature ranges between 32 and 41 dag. Cent., and a comparatively warm rain pentrates through the fiscures of the rock, entering right into the cavern, will there be a temporary cain and distinct meiting of the ice.

The Dachstein ice cave comprises several domes filled with ice, which com-municate with one another through a number of frozen gaileries. An icc crevice 89 feet deep and 116 feet in width traverses the floor of the cavern 165 feet from the entrance. Gigantic ice pillars were found to tower on both edges of this chasm, in the depth of which there unfolds a fairy-like ice scenery. Beyond the abyas the cavern widens out into a mighty dome ("Tristan Dome" as it is called), where a plain ice sheet reaches from one wall to the other, carrying ice stalagmites of the most fantastic shapes. This hall is continued in a gallery through which flows an ice river A hall of imposing di-mensions (390 feet in length, 231 feet in width and 116 feet in height), called "Parsival Home," is next entered quite shruptly, which exhibits an immense va-riety of ice formations of every description The descent to the bottom of the cave is made over an ice river, known as Montanivasch Glacier At the foot of the glacier a lake of ice spreads from end to end of the hall, carrying ice stalagmites of animal likeness. Over an ice wall 50 feet deep and through a portal formed by huge ice arches, access may be had to ond part of this underground This is distinguished from the second part world. former by a considerably higher temp ture, preventing the formation of ice. Tremendous rocky deserts with an enor-mous chaos of boulders here take the piace of greenish shining ice domes. The largest room is "King Arthur's Dome," a cally central hall, 660 feet long, 330 practically central hall, 6 wide and 100 feet high. Its huge side galleries contain, in addition to stalagmites of cauliflower shape, an enormous mass of crystalline erratic blocks brought down to these depths from the Central Alps by the underground rivers of an early geological period.

#### A Bridge Within a Bridge

A NEW \$600,000 steel bridge has been with the Taxon over the bay to open up the tide flats to industrial concerns. While the new bridge was being built, the old bridge senanted to service and the accomplishing photograph shows the two bridges, due above the other, the old beinge new yet yet removed at the time the

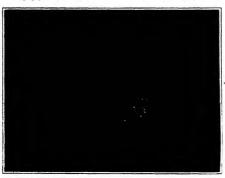
鐵鐵 的现在分词



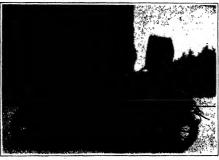


Changing plates in a raincoat.

Buttresses of an elm tree.



The Dachstein cavern; Parsival Dome, showing the ice lake.



Automobile searchlight for the French army.



New vertical lift bridge built over a swing draw.

picture was taken. The new bridge clears the water at high tude by 90 feet, while the lift span when raised provides a clearance of 135 feet, the lighest point of the structure being 175 feet above the water. The vertical lift weights 800 tons and is supported by two 400-ton concrete counterweights. The lift is raised and lowered by cleertricity. The bridge, including wooden approaches, has a total length of 3,000 feet, of whell 2,100 feet is of steel. The lift span is 220 feet long and 70 feet wide, providing a road-way 50 feet wide with sidewalks ten foot within a road-way 50 feet wide.

#### A Curious Elm Tree in Florida

THE necompanying photograph shows the base of an elm tree, which was standing on the banks of the Dklawaha, near Silver Springs, Floride. The inter-esting features of this tree, well illustrated in the photograph, are the high buttress roots at the base of the trunk. tresses are plank-like outgrowths not more tresses are pinna-tike outgrowths not more than an inch or two thick, extending 6 or 8 feet outward, and about 5 feet upward along the stem. These neted as stays or props to preserve the upright position of the tree, which grows in wet shallow soil underlaid with hardpan. They are a comman occurrence in many tropical trees, which, as a rule, have tall straight trunks with the branches and leaves only at the top, and, therefore, require some support us is offered by these buttress roots. Such "spurs," as they are often called, are commonly seen in large mahogany, Spanish cedar, and cellu trees in tropleal America, hat it is very unusual to find trees from the temperate clumate with such pro-nounced buttress development. This curions elm tree was found a number of years ago, but recently it had to be cut down on account of certain improvements. The stump was dag up and removed to a more accessible place, for the benefit of the many tourists who visit Silver Springs

#### Automobile Searchlight for the French Army

URING the maneuvers of the French Darmy in the Southwest, which began on September 17th, a searchlight automo bile was used; that is, an automobile with blie wire used; that is, an automobile with a powerful searchlight suitably mounted at the rear of the body. The swivel stand-ard of the searchlight is clamped to a plate which is yieldingly supported between coll springs carried on bolts. This prevents jars from being communicated to the searchlight when the machine is in motion. To steady the searchlight while In transit, it is held by four guy cables, the two forward ones being uttached to coll springs so as to absorb shocks. The searchlight will project a powerful beam to a distance of three kilometers (1.86 miles) The automobile carries a tripod on which the standard of the searchlight may be clamped at a moment's notice when desired

#### The Pseudo-language of Monkeys

CONCERNING the supposed language of nuthropoid upes, Prof. Boutan has recently taken up the question and arrives at a negative result. It will be remem-bered that Dr. Garnier came to the conclusion that monkeys have a language analogous to human language and express themselves by signs as well as by sounds which they emit - According to Prof. Bontan, there is only a difference of degree between this and laman speech and not one of kind. He observed the sounds made by a gibbon which he had captured when young, and his experiments cover more than five years. He finds that the animal can produce only spontaneous and instinctive sounds corresponding to a state of satisfaction or the like, or again to a stale of uneasiness or feat, also great exeltement, and the sounds do not appear to correspond to a real language, but rather to what he calls "pseudo-language."
While sounds of real language are acquired by education, those of pseudo-lan guage are purely spontaneous, and he thus differs from Dr. Garnier's conclusions.

# Inventions New and Interesting

Simple Patent Law; Patent Office News; Notes on Trademarks

#### A New Type of Spiral Gear Differential

Of the many parts of the motor vehicle, it is doubtful if any has been given less attention than the differential mechanism. The device is pulpally im-perfect and long has been viewed in the light of a necessary evil. It is not fully light of a necessary evil. It is not full automatic in action, or rather it does no automatically accommodate itself to the requirements of the car under certain nditions that are fairly common. instance, it does not proportion the driv ing effort of the engine according to the iraction obtainable at the driving and it is for this reason alone that a number of maunfacturers of commercia vehicles have equipped their products



Spiral gear differential.

with devices to throw the differential out of action temporarily

With the device that is shown by the accompanying illustration all the disad vantages of the orthodox type of spur goar differential seem to have been eliminated It is a new type of differentia differing from anything else of its kind Instead of the usual spur gears, the dif ferential gears are of the spiral type Because of their shape the action of the chanism is different from the action of the familiar differential. The master driving gear remains of the bevel type, as may be seen by the picture.

Owing to the shape of the spiral gear teeth, those that are anchored to the drive themselves. It follows, therefore, that while the vehicle is moving in a stratght line the whole mechanism is virtually locked -- insofar as the drive from the engine is concerned -- and the axle ro-tutes as a solid one. If one wheel should encounter slippery roadway and lose truc-tion, all the drive then automatically would be taken by the wheel on dry mave

ment where traction was undisturbed.

When the vehicle rounds a curve, how ever, the spiral gears are driven by the road wheels, thus permitting, or rather eausing, a differential action similar to the action caused by the ordinary spur gear differential. There is this important ee between the action of the spiral gear differential and the other: The usual type of differential is governed in action by both the distance traveled by the wheels and the traction obtainable by the wheels separately, whereas the spiral gear differential is numflected by the traction obtainable, and its action is governed sole ly by the distance traveled to the wheels

The new gear is the same size as the ordinary type of differential mechanism, for which it can easily be substituted, the operation requiring not more than one our, where the driving axles are of the full floating type. That it is not more difficult to manufacture than is the ordi-

nary differential is made plain by the fact of rock, but is reached by passing the pixel that six of the spiral gears are identical through chinks in the broken work walk. that six of the spiral gears are identical and are of standard size and shape; two other spiral gears are identical; and the honsing is exactly the same as the usual spur gear differential housing. two kinds of spiral gears are siike, only two settings of the gear cutting machintwo settings or the gear cutting macani-ery are necessary, whereas each gear in the spur gear differential must be cut sep-arately. Incidentally, for the ordinary 80 rse-power car, it is pointed out by the makers, some 72 gear teeth must be cut for a spur gear, whereas with the spiral mechanism the number is reduced to 54.

#### Apparatus for Testing Mine Gase By Frank C. Perkins

NOVEL apparatus for testing min-A gases is shown in the accompanying illustrations. It consists of a small braspump by which gases are pumped through an extension pipe to a Wolf testing lamp The percentage of hiflammable gas intro duced into the combustion chamber of the tamp by means of the pump may be de termined by noting the appearance of the tip and the height of the fiame. The gus is introduced into the lamp in very small quantities just sufficient to affect the character of the flame without danger of an explosion. With this apparatus it is possible to detect the presence of dangerons gases even when they are not pres ent in sufficient quantities to cause actua explosion. When examining old working places where the roof is badly caved and

dangerous it frequently happens that the inspection is not as therough as it should

be because of the danger of entering

fire-boss may stand in a place of safety and obtain his sam ple of the atmosphere by using a long ex-tension tube. A few strokes of the pump will be sufficient to draw a sample of the atmosphere into the safety lamp, into which the gas is forced by the nump. The accompanying operator testing the atmosphere in a chamber thirty feet away, which has been cut off by a fail

ever, the operator or



Mine testing apparatus.

#### Novel Multiple Drill Head for Roller Bearings

ONE factory has circumvented a troublesome problem in machine design by a special multiple drill head. It was proposed to design a drill head which would drill eleven 0.255 inch roller seats aced equidistantly on a 1% inch circle The comparatively large size of the seat on this small circle rendered the spacing of adjacent holes so extremely close that it was considered impractical to drill the eleven seats in one operation and at the same time retain a sufficiently strong spindle construction to make the head practical. With an ordinary multiple delli head the roller cage with eleven holes could not be drilled in two operations, and therefore the head was designed for do ing the work in three operations, but working simultaneously on three roller cages. The result of this design is a multiple drill head for attachment to an automatic dial feed drilling machine,

The head is attached to and driven by the automatic drill press having a turret indexing table containing twelve chucking stations evenly spaced on a 9.6-inch circle, in which table twelve cages to be drilled are placed at the same time. The drill head contains three sets of spir two having five drills each and the third one drill, located on a radius corresponding to the chucking stations of the index-

With the turret containing twelve case the drill head is given its first plunge, drilling five holes in the first cage, five in of the danger of entering the second, and one hole in the third.
With this apparatus, how-

one twelfth of s the first cage under second group of spindles, the second under the third spin dle and a new cage under the first group the three operations are carried on successively until one although three cages are operated on at the same time. While these operations are in progress the operator has ample time to remove the completed cares as they

ome out from under the drills and to in-

Each of the three sets of spin provided with a receding pliot which enthe drills and forces them into preper alignment. The receding pilots for the second and third spindles have locating pins which enter the holes already drilled and register accurately the spacing of the holes remaining to be drilled.

## An Unusual Type of Tire Inflater W ITH the growing tendency of auto-mobile manufacturers to fit their products out with complete equipment, inuding a great many devi-



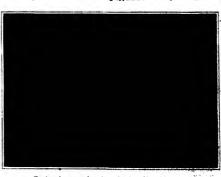
one time were viewed in the light of "extras" and paid for as such, greater attention is centering upon the necessity for power tire inflators. Of the several that have recently been placed on the market that shown by the accompanying illustration is unique in that it is the first to em-ploy the diaphragm principle so well

known in hydraulic pumps.

Needless to point out—for the part se
tional picture makes that fact plain has no piston nor has it a cylinds word is usually understood. For these reasons the minimum of attention during operation (which means lubrication) is required. As there is no opening betw the "crankshaft" if such the eccentric that drives the member attached to the dispuragm may be termed, it is at impossible for oil or oily paper to be dis-charged into the tire. The air chamber and the crankcase are quite independent in fact, and the former is perfectly by the rubber disphragm.

#### Fire Sprinklers-A Correction

I No or jesses of September 18th. we pub-lished in article on electrical fire pro-tection degices which requires correction. It was the way of the second of the con-traction of the contraction of the con-ceptance of the contraction of the con-section of the contraction of the con-section of the contraction of the con-section of the contraction of the con-traction of the contraction of the contraction of the con-traction of the contraction of the contraction of the contraction of the con-traction of the contraction of t ure is too nigh. The proper cost of spring-ler work, we are assured, varies between \$5 and \$10 per head. So, too, the state-ment that a one hundred thousand dollar factory could be protected only at the exnditure of \$20,000 is in error. We are formed that a \$100,000 factory could informed that a \$100,000 ractory count probably be protected for \$6,000. These corrections are made because it was our intention in the article referred to, to call attention to the merits of the sprinkler system, which indeed the article did



Testing the atmosphere in a chamber thirty feet away.

THE PATENTED INVESTIGATE These columns are spen to all patentees.
The better are inserted by special arrange must with the investors. Terms on applies him to be a districted by a partial of the first of the first

Pertaining to Apparel,

SELP-ADJUSTABLE HAT RETAINED.—
E. SEARCH, PUBLISHE HAT RETAINED.—
The investion relates to improvements in hat
self-and training of the published hat relates a
defe hat relation for pertains het raches such
as are used in hat shope during the process
of annufacturing for the purpose of assurdanting for the purpose of assurdanting
the bate and transporting the same from
place to place.

SEED GATHERING ATTACHMENT FOR MOWERS.—Y. M. JACKSON, Laurel Hill, La This attachment is arranged to have support from the finger her of the mower, to be adjustable vortically of the latter, a frame mean



SEED GATHEBING ATTACHMENT FOR MOWERS

her of the attachment bring adapted for mount-ing on the said of the mover so that in the adjustment of the flager bar, the attachment will eving with the said said as a center, there being a batter reel operating over the sweet ORICHARD HEATER.—I. T. Lieser, Airth. Tw., This bester prevents injury to fruit trees from cold. It is provided with a num ber of compartments separated from one an-order by appropriate means for preventing the other hyperopriate means for preventing the this promoting safety of the apparatus.

#### Of General Interest.

Of General Interest.

BHAYING RRITHE.—F. J. McGraws, 2969

Bouth Haisted St., Chiegeo. III. This sharing

Bouth Haisted St., Chiegeo. III. This sharing

relatively driver than the bristles and contend

among them. the rubber being adapted to be

brought into action with, and independent of

the braud no be moved to insoparative position.

BOOKBOLDWE.—W. H. Momer, 448 Basters Parkway, Brooklyn, N. T. This hookbolder will hold a hook securely in position and

at the same time smalle the roader to turn

place. The holder is provided with an adjustable clamping bar, which normally present

also clamping bar, which normally present

and the same time of the provided of the same and the control of the same and the control of the same and the same and the control of turning the leaves.

EVAPORATIVE REFRIGORRATOR.—G. B.

EVAPORATIVE REFRIGORRATOR.—G. B.

permit of tunning the leaves EVAPORATUR REFRIOERATOR...-G. R. HABRILD, 750 % Maple St. Spokane, Wash This improvement has for its purpose the pro-vision of a simple darde, whereis the refra-eration is brought about by the forced evapo-ation of water, which is economical both in construction and operation.

construction and operation.

FARTENING FOR HITCHING STRAPS.—
P. ROMMER. SIS E. 11th St. Pitteburg. Ean.
The object of the lavention is to provide an improvement in hitching strap attachments whereby straps may be expeditiously secured around a post or to a ring without tyting it the mean immore.

the musi manner.

\*\*PREPROOF FILING CARE.-J. A CLARK
Box 327, Albany, N Y The invention provides a new and improved freproof filing case
for filing or housing rolled articles such as
maps, charts, drawings and the like. Within
an outer cylindrical shell of sheet metal of



PIREPROOF FILING CARE

other suitable material is artunged, concentric-ally, another cylindrical shell, an annufar space being thus formed between the two shells. By spacing these shells apart an air paper is provided which protects the con-tants of the filling case against heat isodient to a fire in the hubbling or room in which the case is stored at the time.

the case is given at the time.

WTMAN TRAP.—]. As BEFORMER, York, Pa.

The invertion provides a device whereas a special chamber is provided for separating the special chamber is provided for separating the stems and water pilor to their administra to the tong proper, and wherein the water of condensating will be automatically resident at depth additional to prevent the ending of special policy of the special provided at a depth and the special provided at a special policy of the special policy of the

se shipped to any part of the world erected with facility, whereby a a substantial character may be facility and the building further



SECTIONAL CONCRETE BUILDING.

more will possess a pleasing character with respect to symmetry and appearance. It may be erected by a party having little or no spe-cial skill by following the directions issued Hardware and Tools.

HATCHWARE AND TOOLS.

LAWN MOWER SHARPNER.—C E. Rix
Bedford City. Va. The invention relates a
sharpeners, and has reference more partic
ariy to the class which comprises a suppocarrying a sharpening stone slidably mounts



LAWN MOWER SHARPENER.

on the lawn mower frame when desired to sharpen the mowing kuires. It provides an lezspendre, simple and reliable sharpener to means of which the rotating kuives can be roperly sharpened with reference to the sta-tionary kuife, and in which the sharpening stone is guided by the stationary kuife

#### Heating and Lighting.

Heatlas and Lighting.

HOT WATER TANK—F. L. PATTERSON,
Brooklyn, N. Y. N. Y. The object here is
to provide a tank more respecially for use in
buildings requiring an ample supply of bot
water, and arranged to silve for the expasion and contraction of the steam tubes to
insure proper expanded on of channel or line
to the contraction of the steam tubes to
insure proper expanded not obtained or line
readily carry of all the water of condensation without danger of such water accumulat
lag or backing up in the steam tubes

LAMP—N. (CTON. Clinion. Ind. This is

ling or oacsing up in the steam tures LAMP—M. Corrino, Ciliaton, Ind This in vention refers to minera' lamps, and is more particularly intended for use as a miner's lamp burning scetylene gas generated in the lamp it provides a combination lamp employing, in connection with the main lamp, an auxiliary



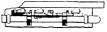
MINER'S COMBINATION LAMP.

lamp designed to be iemporarily lighted in emergencies, to furnish litumination while ad-justing, recharging with carbid or water, or otherwise giving necessary attention to the main lamp.

reptacies containing food at differen

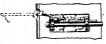
heights from the table.
FRUIT KNIPE.—R. R. Lydick, 550 Sheridas Ave, Pittshargh, Ps. This fruit tails or peeler la of use for renoving the skin from erages, lemons or other ritum fruits, and an object of the lowestion is to provide a knife having means for sitting the skin in sections, means for reloving the skin and white pulp, and means for recoving the skin and white pulp, and means for recoving the skin on the fruit sections.

fruit.
ATTACHMENT FOR GAS STOVER.—C P.
ELLIS, S. W. corner 4th Ave and Deaderick
St, Nashville, Tean. The principia inject of
this inswetton to to provide an attachment
for gas stover comprising a spring-pressed and
movable element having parts thereon adapted for angageaneut with the handles of the



ATTACHMENT FOR GAS STOVES

valves when in one position and adapted to be moved to a second position, thereby permitting turning of the valves, suitable on estim sense being provided for maintaining the parts in such accords position. The illustration shows a side view of the attachment on a stove, the handles of the valves being operation. The state of th



SAFETY ATTACHMENT FOR GAS STOVEN.

athle to turn on the gas willout first opening the door of the oven and furthermore pre-vening the closing of the said down without either shutting off the supply of gas or wait ing until the temperature of the oven has reached a certain degree, thereby tending to prevent the landwortent escape of gas with con-sequent fatal results. The ongraving shows a vertical side lewe of the gas store

#### Machines and Mechanical Device

Machines and Mechanical Devices.
CCTTER IRAD —Giomo A. Evanox, care
Definer Machine Works, Definer, Ohio The
sim of this leavetor is to provide a entire
head previded with adjustable bit or biade
holders, arranged to prevent marring or brusiing the head by ciamping serves, or as the replish the dealierd result, use is made of a hub
provided on its peripheral face with a series
of undereut grooves extending parallel to the
axis of the hub, the bit holders having hases
stidingly expansing the clamping memiers of a
contract with the waits of the groove
CONTROLLING VALVE—R. S. SMITEL, 108

ing contact with the waits of the groove CONTROLLIAN VAINE—A. 8 Naturit, 108 Cottage Drive, Covina, Cal This vaive is for use in all braike equipments, for controlling the distribution of the air from the train pipe and signal pipe to the triple vaive, by means of which the triple vaive and brake mechan lam of any or amy be connected with the at mosphere, while retaining n connection be tween the train pipe and the usuitary resem-

main lamp.

\*\*Monumboold Willitties.\*\*

WHEN MATTERES. —O. Gasta, 28 Camborland & Matter Competitude of the Competitude of the

Franko, Mechanicsharg. Pa. This invention relates to an apparatus for recording the presence of smoke or fames and the principal object is to furnish a simple, cheep, and effort mechanism satted to the purpose which will be a simple of the purpose which will be a supported to such desired a construction superior to such desired and the suppose of the purpose which will be a suppose the purpose which will be a supposed to the purpose will be a supposed to the purposed to the purpose which will be a supposed to the purposed to the purpose which will be a suppose

vices heretofore employed.

THROTTEING DEVIYE-E E MCCAULEY,
Toft. Cal The investion provides a device
which will be automatically actuated in case
the oil well becomes clogged by sand, causing
the pumping mechanism therein to stop, or in
case any of the parts connected to the pumpings mechanism should happen to break to
grame the pump to shut off the supply of motive
acting the pump to shut off the supply of motive
agent thereto and stop the machinery immediately before further damage can result
COTTON HULLER, CLEANING, AND FRED.

ately before further damage can result COTTON HULLER, CLAS.NIR, AND FRED-EII.—J F WOLFINGER, BOYSTON, Okla In order to provide an Inseparative cotton buller, cleaner and feeder, which will efficiently and rapidly separate the hulls and foreign usin stances from cotton so that the cotton is clean when extering the null, Mr Wolfmer has in vested a marchine applying a plursity of vested as marchine applying a plursity of integrating moment. All supported and inclosed in a proper casing

#### Railways and Their Accessories.

RAIL JOINT FOR PORTABLE TRACKS -- P. J. THULL, Culebra, Canal Zone Where meannia JOHAN FUH PUNTABLE TRACKS.—

J. TUILL. Culters, than 2 four Whereman and the state of th

displacement
DRAFF RIGGING.—G: 11 Monomemors, 1427
Hanover Rt. Baltimore, Md This invention
comprehends a draw-har so arranged that when
In normal or inactive position it is subjected
to the teasion of a spring and when in active
use for pulling cars the teasion agon the
appring is increased, and when the pull upon
spring is increased, and when the pull upon
the pulling that is the pull upon
the pulling that is the pulling that the pulling the pulling the pulling that the pulling the pulling that the pullin

DERIGN FOR A SAVINGS BANK AND STAND—C DE YOOS, 520 53rd St, Brooklyn, N Y This design comprises a hank shop to resemble a league leasehail, the slot to revive money being pixed at the top. An orna medial stand holds the bank pixed in the cer of the againer.

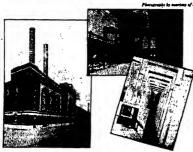
DERIGN FOR A SUPPORT FOR DISPLAY RACKS -- J SUBLES, 482 W BYONGWAY, N Y, N Y In this ornameutal design the support has four fect and is of an elevated, irregular but highly graceful form

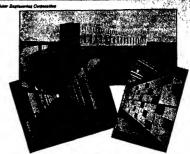
Norm.—Copies of any of these patents will be furnished by the SCIENTIFIC AMERICAN for ten cents each Please state the name of the patentee, title of the invention, and date of this paper.

We wish to call attention to the fact that we are in a position to reader competent services in every branch of patent or trade mark work Our staff is composed of mechanical, electrical and chemical speries, thoroughly trained to prepare and procedure all patent applications, respective of the complex nature applications, respective of the order of the applications, respective of the order of the applications, respective of the conject nature.

ctalized, technical, or associates throughout that world, who saist in the prosecution of patent and trade-mark applications filed in all countries foreign to the United State of the Countries foreign to the United State of the Countries of the

Branch Office: 625 F Street, N. W., Washington, D. C.





IN high-tension power houses, like the above, where gigantic forces are imprisoned on every hand, absolute cleanliness and brilliant light are matters of life and death. To secure these important factors in the highest degree the Construction Engineers advised, and the Engineers of these two great corporations approved, the use of

# RICE'S MILL WHITE AND GRANOLITH

The concrete work in the South Boston Power Station and in all the sub-stations, is passied with Ricce's Mill White A glossy, till-like, sanitary finish is the result It alfords 10 to 36 per cent more light than could be secured by any other means Ricc's Mill White is an Oll, paint which will not crack or craze, which will retain its Irdilliary and whiteness longer than any other gloss paints.

The concrete work in the Power House of the Mississippi River Power Company, which is transforming the mighty flood of the Mississippi into power and light; is painted with Rice's Grantollith, a tough, cleastic, permanent hinks, which becomes a part of the concrete to which is a splited. It is the best covering known for concrete. Makes an excellent primer for a second coat of Rice's Mill White,

We were the originators of Mill White Paint and Granolith. Our process of making RICE'S MILL WHITE, discovered and first used by us ten years ago, made the reputation of the tiante. "Mill White." The Rice processes cannot be used by any other paint manufacturer. Rice's Mill White Paint is odd direct from the featory in barrelia containing admicent paint to ever 20,000 a.q. it, with one coat. If you have that area of ceiling and wall page to covere,

Write for Booklet and Sample Board

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23 DUDLEY STREET

PROVIDENCE, R. L.

# Halve the Cost of **Bearing Repairs**

The best bearings of the best machines were out a woner or later. Machine tools, grinding machinery, automobiles, textile and other high-grade machines and colory fitting bearings. When the hearing get even a little lone, the expenses machine must be shut down and expenses machine must be shut down and continued to the state of the state of

Until recently, plosphor bronze was the best bearing bronze known. To-day a new-vihool bearing bronze has taken as place.



### twice the life of phosphor bronze

nd cutting save under the most shoon mu of neglect or shuse, and therefore is no to four times as long as other best

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#### How the Government Tests Paper (Concluded from page 260.)

cure sufficient and representative samples for slight differences in materials and proes of manufacture may affect the general run.

The next test is to determine the thick-ness of the sheets or the bulk. With limit-ed space in both public and private librarles a demand has arisen for less bulky books, and consequently thinner paper and to-day it is considered the best practice to employ a paper of better quality of material, but of less bulk. The roughest test for thickness is to take or fold to gether a certain known number of sheets and then measure their tilickness with a rule or more usually with a caliper rule increused accuracy is secured by the us of some form of calipers for the single sheets, while for the most refined measure ments a micrometer gage that may be read to 1/1,000 or better 1/10,000 of an luch is employed. This is an ordinar; form of screw micrometer, but care mus be taken to secure an even and constant sure, and the average of a number of readings, at least five, should be taken rendings, at least nvc, snound be taken There are also direct-rending micrometer thickness testers, and one of these used at the Bureau of Standards is shown.

#### Ascertaining the Strength of a Sample.

Strength is the next important consideration, and is one of the more usual cration, and is one of the more usual commercial tests to which paper is sub-jected. In the ordinary American strength tester, usually the Mullen type, a sample of paper is changed about a circular opening one square incit in area, below which there is a rubber diaphragm. By means of a hand wheel the pressure of a liquid

true as it corresponds more closely with the mean strength or the strength in the cross direction. With this machine the application of the pressure by the manipu-lation of the wheel and other conditions can effect the rendings, so that the same

It is also desirable to ascertain the ten sile or breaking strength as well as the bursting strength, and for this use is made of a German machine, the Schopper strip tester, in which the weight remired to is automatically recorded and the amount of stretch before rupture. This test is the approved one in Europe for strength. and in recent United States specification tests with the Schopper machine are spe cified, though a corresponding test on the Mullen machine is given for the benefit of manufacturers not supplied with the German apparatus. A strip 15 millimeters in width and 180 millimeters long is taken, which is clamped at efther end and the tension is applied with a piston and cylinder. In this test strips both with and against the grain of the paper are used and information is gained by the two sets of tests as to the structure of the paper. The German method is to state the strength of a given sample in

state the strength of a given sample in terms of the length required to break it when suspended by one of its ends. The test for endurance comes in meas-uring resistance to folding, which test takes the place of the former rough crump ling test where a square sample of the paper was taken, crumpled up in the hand, noothed out, and then crumple opposite direction, repeating the process and observing the number of minute holes formed along the creases. The folding test is very important as determining the on in dispiraging is increased infill the durability as the greatest wear comes paper is suptured, the number of pounds where a wheet is folded in hinding in a pressure being indicated by an accurately book or pamphile or in the case of a calibrated gage. The bursting pressure, map, bond, or legal document, that must the average of ten readings, is assumed to represent the mean strength or the average of the strength across and length—planted by the folding anachies, which is wise of the sheet, but this is not strictly—planted by the folding anachies, which is



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LINE 41-65 Scandmay, Now York Philadelphia Boson Pitthenen Chinge B. Lank curate and quantificative results. By many authorities it is considered the most valuable slugie test to apply to paper to determine bus probable durability in actual service. In the Schoquer folder a strip 15 millimeters wide and 05 millimeters to longth under a standard tension of 1,000 grammas is bent linet and forth repeatedly on itself, until the fibers wear through at the line of folding, and the number of double folds automatically is registered. The paper of the greatest endurance has the highest "folding number." For example in an extreme case the tim-summent specifications for the "best purchasent deed" paper require that it shall have a folding endurance in the week direction of not less than 2,000 double folds.

#### The Influence of the Atmosphere.

The expansion of paper under various atmospheric conditions is important in my printing operations, and this is tested by measuring the sheet as temperature and humidity are varied. Then there is the measure of the amount of absorption, which is determined by the height that a liquid will rise by capillary action in a given time when a strip is suspended ver tically with the lower end lumersed in water. Such a test is of course peculiarly applicable to blotting paper. cal team of paper must be carried on at a standard temperature and humidity, which, at the Bureau of Standards, is taken at the average temperature of 65 deg. F. and 65 p. c. of relative humidity, the elaborate heating and ventilating sys-tem of the bureau permitting the realiza tion and control of these conditions transparency of paper may be decided by the number of sheets which must be interposed between a standard source of light such as a 1-candlepower Heffner amyl acetate burner and an observing tele-scope to cut off the light. This, however, though meful in the case of tracing pa-pers, window envelops, etc. is a test of limited value

The testing of paper by no means ends with the physical examination. Under the microscope the kind or kinds of fiberfrom which a sample of paper is unde readily can be identified, not merely long fibered materials such as cotton, flax and hemp, which afford the most durable papers as they yield a nearly pure cellise, but others which have been to extensive chemical treatment. At the Burean of Standards microscopical ex-anination is able to indicate the correct ther contents of a sample within 5 per cent in the case of a mixture of rag and bleached chemical wood, while in the case of papers formed by combinations of phite and soda palp and contabiling ground wood a degree of accuracy well within 10 per cent has been secured special technique involving the treatment and stabiling of the fibers has been devel oped so that they readily are recognized and their relative proportions estimated

#### Analyzing "Loaded" Papers.

Chemical analysis is necessary to determine the amount of loading or white insoluble mineral matter added to paper during manufacture to improve printing qualities, increase opacity and reduce weight. In the coated papers med for fine half-tone printing this muterial may anomat to 30 per cent or more, while in other papers it varies from a minimum of til, per cent. While ossential to detail in fine half-tone printing it weakens the paper and decreases list durability. This loading is determined by its amount of which is stated in paper specifications. It is ascertained by harning a small assumpte of paper in a platinum crueble until there is no carbon in the residue, which is lien cooled in a desicutor and weighed, being subjected to analysis in case it is desired. The amount of ash thus obtained is easily less than the actual amount of loading or filler, which may contain water and other volatile agents that paiss of the burning. Chemical analysis sife overein the native of the



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For years, smokers had been waiting and longing for the tobacco of PERFECT FLAVOR.

Stag took the wonderful Burley leaf, found new perfections in it, and gave the world a tobacco whose fragrance and flavor touched new heights.

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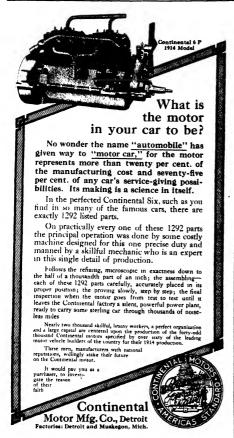
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paper suitable for printing or receiving the ink. These may consist of glue, case in, starch or rosin, and when used in unounts may affect the strength as durability of the paper. The analysis will also indicate the nature of the coloring matter used.

aper testing and analysis are at raper testing and snatysis are also ex-tensively carried on in private and com-mercial laboratories with which the Bu-reau of Standards in no way seeks to com-pets. In paper as in other industries, its services have not been confined to the Na-tional Government, but it has sought to improve and advance manufacturing and trade conditions by the formulation of oper standards and technical res In this, the paper testing laboratory in charge of Mr. Frederick C. Clark, to whom the author of the present article is under obligations for information and photo-graphs furnished, has been eminently suc-

#### Recent Improvements in the Refrigerating Industry (Concluded from page 261.)

is in the form of a liquid as when in the gameous condition. In this condenser the hot gas entering at the bottom comes in contact with the cooled liquid, gives up its heat to the liquid and become densed. The liquid thus heated rises to or part of the condenser where its heat is transferred to the cooling water when in transferred to the cooling water, When in operation the condenser is prac-tically full of the liquefied refrigerant. Of course there is always a constant flow of liquid to the expansion coil from some point in the condenser above the gas in

Important changes have also been made in the expansion or evaporating device but these changes involve the method of eration rather than the structure. Until recently the general practice was to permit the high pressure liquid refrigerant to pass into the expansion coil through ant to pass into the expansion coll through an expansion or throttling valve in the form of a spray. As it passed through the evaporator this spray was gradually con-verted into a gas by the heat absorbed from the substance to be cooled, and the compressor and recompressed. It was found, however, that by maintaining the evaporator partially filled with liquid refrigerant the cooling was much more uni form and satisfactory.

form and sansaccory.

In Fig. 4 is shown a section of a shell brine cooler of the flooded type in which the brine to be cooled is forced through the tubes by a pump. The shell is maintained practically full of liquid ammonia. the inflow being governed by a float valve as shown. The ammonia vapor produced as shown. The aumobile vajor produced by the heat of the brine is constantly drawn off at the top by the compressor. In construction and operation it is not unlike a steam boller. The heat, how-ever, is obtained from the brine flowing through the tubes instead of from com-bestion serves Abana and the combustion gases. About one tenth of the liquid ammonia flashes into vapor as it enters the cooler by reason of the reduc-tion of pressure. In the flooded type of cooler this vapor does not mass through the cooler but is led direct to the suction

In the absorption refrigerating field bu few changes have been introduced except attempts to make such machines auto matic so that they can be used for ho hold purposes. The recent discovery that ertain solids, particularly sulpho-cyanic of ammonium, could be used as the ab-sorbent in place of water, attracted much attention. This absorbent gave very flattering results as to heat efficiency, but d to be extremely corrotive, destroying the walls of the generator in a com-paratively short time. Should this diffi-culty be overcome, the absorption machine

culty be overcome, the sheorytion machine may come into more general use. Trobably the most extensive use made of artificial refrigeration is in the manufacture of tee, for except in the most increment successful to the continuous statement of artificial refrigeration is in the manufacture of tee, for except in the most increment statement of a statement of the continuous statement of the co



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proptes the only ice available is that which comes from the local ice plant, and cically all such ice is made either by the can or plate process. In the former the cans of water are set in a tank filled ith brine which is cooled by the am-onia. The ammonia coils are usually arranged between the rows of cans, but a shell cooler, such as is shown in Fig. 4, may be employed, and the brine is circu inted through the shell and thence around isted through the snell and the caus. The brine is cooled by the ammonia and this cold brine around the caus the water therein to freeze. The brine acts merely as a heat or cold trans-ferring medium, and in addition serves as a large reserve of cold in case the compressor should be stopped for any reason. Common salt and calcium chlor-ide are used for making the brine. When all the water in a can is frozen the can is drawn out and warm water is poured over the outside until the eake is loosened and slides out, after which the can is refilled and replaced in the cold brine. In refilled and replaced in the cold brine. In the plate process a series of freezing plates are arranged side by side in a tank filled with water and the ice forms in large cakes on the sides of the plates. The wa-ter is kept in constant circulation through the tank in order that the ice may be clear. Each freezing plate is made up of a large number of connected pipes ar-ranged one above the other, through which To freeze a cake a foot thick requires about a week. case a root their requires about a week. In removing the cake a warm fluid is cir-culated through the plate until the tee is loosened and it is then lifted out and cut into pieces of convenient size.

In the ice manufacturing industry the most marked improvement has been the development of the raw water system. Should cans filled with raw water or ordimary city water be frozen without any agitation, the ice will be white or opaque, due to air bubbles and sediment frozen in due to air publies and sentment roses in the ice, and for this reason distilled wa-ter was heretofore universally used in making can ice. However, by injecting a constant stream of air into the raw water during the freezing, ice can be ob-tained as clear and pure as with dis-tilled water. To distill all the water used in a can plant is an item of some expense. and especially so where other power than a steam engine is used. Fig. 5 shows one of the latest forms of the freezing can The air is injected through the bottom of the can, which is not exposed to the cold brine. Pipes for circulating water through the can are also provided. The cans are secured in the tank and to harvest the ice the brine is warmed sufficiently to loose the cake.

Important improvements have also bee made in the freezing plates of plate ice systems. In the older forms the ice cake systems. In the older forms the ice cake was frozen on one side of the freezing plate, and as the transmission of heat through the ice is very slow, it required a number of days to freeze a cake of marketable thickness. With the apparatus shown in Fig. 6, the time of freezing can be very greatly reduced. This device conhe very greatly reduced. This device consists of a row of outer tubes closed at the top, projecting up into the tank and inclosing inner tubes open at the top. These tubes are connected with supply and return headers for the refrigerant which may be brine or liquid ammonia. In operation, the ice gradually increases in thickness around these tubes until the various masses meet and coalesce to form eserum masses meet and coalesce to form continuous cake. This cake is harvest-d by divolating a thawing fund in lieu f. the refrigerant, and when loose, the side is lifted out and out up into con-sident also.

. In the field of cold storage probably th the field of cold storage promoner t important improvement has been in the method of transporting for vegetables. It is now generally and made in ... and yearshies. It ... and yearshies is precopiling these ... also that by precopiling these ... before satisfacts they reach their desir files in his reter condition and smooth. As a week in transit than with the instance of the condition of the con method or senerall



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fruit and vegetable shipping polats for cooling the cars after loading. These plants in the main consist of apparatus for cooling air in large volumes, and this corround air in marge venumes, and this cold air is conducted by air mains to the various cars to be cooled.

Another new field in which refrigeration

Another new field in which refrigeration is extensively used is the drying of air for blast furnaces. Fig. 7 shows one of the latest forms of cooling towers for this purpose. It consists of a concrete tank on which is erected several concer-tric metal shells. The air to be cooled en trie metal shells. The air to be cooled a ters at the base of the outer shell and ascends to the top through a heavy spray of cold water. The air then goes down through an annular passage to the bottom of the inner shell and ascends through a wer of cold brine and is then draws off through the central pipe to the blowing In the tank are located refriger ating colls for cooling the brine which aling cons for cooling the firms which is pumped to the top of the lower and med over and over again. As the brine becomes diluted in time by the water apor condensed out of the air being treat ed, it must be drawn off from time to time and concentrated by boiling. In this direct contact method there is no accumulation of frost in any part of the machine and the cooling is much more rapid than with refrigerated surfaces. For these reaployed for cooling large volumes of air.

#### The Newspaper of the Future By Robert Donald

If I were to attempt to forecast the future, and prophesy whal newspapers of twenty or more years hence are likely to be, I would say with some confidence that daily newspapers will be fewer, the that daily newspapers will be fewer, the tendency toward combinations will in-crease, and colossal circulations will con-tinue to grow. A paper which has not at least a half-million readers will not be considered seriously as an organ of the people. The weak newspapers which can ot spend huge sums on news, on features squeezed out, and the paper run as a luxury or for a mission, and not as a business enterprise, will become too expensive except for millionaire idealists. There will, therefore, be fewer newspapers, but the total circulation will be greater. The power of these national journalistic dread noughts in molding and influencing public tion their luftuence is exercised. Besides the national newspapers, giving an epi tome of life, and presenting the human picturesque side of news collected from all parts of the kingdom and all end of the earth, there will be localized newsthe national press in presenting news. There will, I hope, be a revival of the purely local country newspapers, much improved in form and style, otherwise public life will suffer a serious loss. The pace will they give to sectional interests and we shall have specialized daily new papers to take the place of the specialize

weeklies which now exist. The national newspapers will not con tain iess reading matter, but the pages will be smaller. They will be printe ter and neatly stitched, and will, of course, include pictures in color. The future methods of distribution will be onicker, and circulations will cover gre er areas Airships and aeroplanes will be used for the most distant centers; elec tric trains and metorplanes, running in special tracks, will also be used. In all the chief centers of population papers will be distributed by electric or pneumatic papers will be merged, and editions will

come out almost every hour, day and night.

News will be collected by wireless telephones, and the reporter will always ave a portable telephone with him, with which he can communicate with his paper which he can communicate with his paper without the trouble of going to a tele-phone office, or writing out a message, At the other and the wireless richesphone message will be delivered to the sift-editor printed in column form.

The chief composition to the metastal



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Self Sentering is a new form of expanded in for concrete resaltorcing and general freproofing, is a combined reinforcing and centering—a one-p steel lath and stud.

Self Sentoring comes in sheets 20° wide and up to 12' long. It can be curved in the factory to any desired radius. It is adaptable for practically all classes of concrete construction.

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newspapers of the future will not be from other newspapers, but from other methods of disseminating news.

the desirement of the people's recreetion halis, with the cline to the people's recreetion halis, with the cline to the people's recreeting the proposed of the people of

#### India Paper and Its Uses By Willard F. Smith

O NE of the oldest and best papers made is that called india paper, and yet it is little known except to a very few. The formula for making it and the process by which it was made were for many years a secret known only to one mill, and all efforts to produce a similar paper in other mills were failures. However, patient endeavor was at hast rewarded Now good india paper is to be had from at least two different mills in England, one in Italy and one in the United Nataes, and it is interesting to note that the American mill to solve the india paper problem in 1012 was the first mill in the United Nataes to make wood pulp paper, which it did in the year 1854

The essential requisites of india paper are opacity, light weight, low but, smooth fulsa, strength, and a certain rattle cuited "timiness." To embody all these characteristics simultaneously is one of the most difficult tasks in paper manufactures.

Openfy: Is the first thing users of indiapaper took for if the prelating shows through, the paper is of no use. Even with the most copue sheet in light weight, with the most care its required on the part of the printer. His make-ready must be perfect; every line and horder must be inregister with the opposite adds of the page. The utnost care must be excreteed in printing. A day link is sure to give the best results. This does not mean that the average first-class printing establishment cannot do the work; for it can it simply means that care must be given in making ready. The writer was recently informed of a printing job, in which sixteen hundred impressions per minute werrun with great success, proving that production is not restricted by the use of lightweight pages.

India paper must be kept for several days by the printer in a room where the temperature and humidity are approximately. If not quite, the same as in the printing room, and, better yet, if kept in the actual room where it is to be printed. This will overcome curling or "cockle," as it is known to the trade.

it is snown to the trade.

Artention must next be given to the grain of the sheet, which is in the same direction as the length of the paper, while being made on the paper whether. The fibers when run on the machine in many times their summer water certain and resident water certain some circumstant and residenteed has more strength and residenteed has the other more satily than they will break. It is this characteristic which first makes a smooth this characteristic which first makes a mooth fat book. The results when he sheet is printed "with the grain" the other way is to draw it into wrinkles as does a lines sheet when yet through a wringer.

sheet when put through a wringer.
The use of india paper until within a
few years was limited almost exclusively
to Ribbes, prayer books and hymnels. Of
late each year finds some publisher using
it for new purposes and always with great





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| Clearing of the latest issue of o order catalogues. One progressive advertiser changed from the heavy catalogue paper used many years in his annual cate paper used many years in use annual cata-logue to an inexpensive form of india pa-per and saved over \$20,000 on the issue, the principal item being seven cents in postage for each catalogue. A good illustration of the saving in bulk and weigh over the paper heretofore used is found in the new edition of Webster's dictionary. The old dictionary measures 8% inches by 11% inches, has 1,766 pages, and weight 0 counds 1. and weighs 9 pounds 11 ounces. The new edition, printed on india paper, is size 9 by 12, has 2,624 pages and weighs 6 pounds 13 ounces. The old edition is four inches thick and the new edition two and a quarter inches thick. From this it is seen that a book with pages of approximately the same size, the number of pages has been increased about 850, the thickness reduced one and three fourth inches and the weight reduced nearly three

> In addition to the advantage of small bulk and light weight, both of which are so important, india paper has a wonderfully soft amouth surface. It takes line cuts, steel engravings and zinc etcl perfectly and very good half-tones. has one more quality which is really re-markable, and that is it does not suffer from rough usage as one might think; it stands up under hard wear, and if badly crumpled by any mischance it can be smoothed with a heated iron and made as good as new.

# A New Mail Carrying Railway

(Concluded from page 252.) being transmitted without physical con-tacts through pilot coils imbedded in the track member leading to the operator's

When descending a grade, power is re-enerated back into the line, the conserved serving better than a physical brake in keeping the cars close to syn

This system has certain advantages over niniature electric railways without mo tormen, which must be perfectly obvious The same unit of power will se farther and faster when applied as a direct push or pull than when exerted in directly through gearings, bearings, axles and wheels in the form of wheel traction. In lieu of the motor, its accessories and housing, the cars carry only a light pro-pelling member, which being placed beneath the car leaves the entire car space free for freight, thus effecting a saving in weight, care and cost, and increasing the carrying capacity. Instead of being limited to moderate grades, the cars may be designed to take any grade, enabling the delivery and dispatch of mails from ter minals located in second story distributing rooms of post of ces, as in the New York Central terminal station, thus obviating the cost, delay and inconvenience of re handling, as well as the lifting and lower

ing by elevators.

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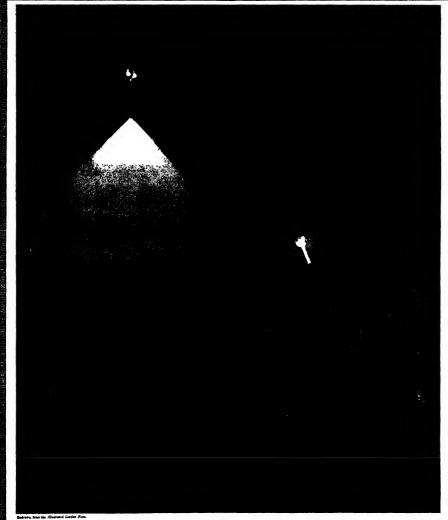
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VOLUME CIX

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AN ILLUMINATING-SHELL FALLING AND DISCLOSING AN ATTACK .- [See page 282.] 

## SCIENTIFIC AMERICAN

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The Editor is always gird to receive for examination illustrated articles on subsects of timely interest. If the photographs are somity, the articles short, and the facts authorite the contributions will receive special alterition. Accepted articles will be paid for at regular space rates.

The purpose of this fournal is to record accurately, simply, and interestingly, the world's progress in sointific knowledge and industrial achievement.

#### A Destroyer of Destroyers

The close of the Russo-Japanese War, the childr engineer of a Russian torpetholiout descripter, who had passed dirough twelve monliss of neithe service in the defense of Port Arthin, children at this office, and in discussing the expectence of the Russian destroyer feet during the sloge, stated his helief that the larger and faster destroyers of the future would become so swift, able and powerful, as to call for the design of some special type of vessel to deal with them

That convention is called to the writer's mind by a dispatch from one of the British dockyards, describing a new type of cruber which has been dockmated by the First Lord of the Admiralty as a "destroyer of doctropers". The vessel is described as being of 3,500 tons displacement and capable of a continuous sen speed of thirty knots. She is credified with a belt of five-lined armon and a battery of 47- or 6-linel rapid-fire gams It is stated that eight of those ships are at present under construction for the British many.

If the vessels are being built for this specified day, their speed, hittery, and protective quality are most too large for the day assigned to them. The modern destroyer has graduated from the "bart" into the "ship". That it is embourts searcothy was proved in the wastern of the state of that vert, when our destroyer feet, on its way to claim, was subjected for several days to one of the forcest storms ever experienced in the western North Matafite and these vessels, but fremembered, were of much lighter construction than those which are now being built for our many

The latest destrovers, moreover, are equable of being driven at full speed under unhellevenlik severe conditions and any vessel which is designed for the special work of overtaking and slinking such vessels must here sell be a large, fast and very stanneh ship. Moreover, it is perfectly logical that the destrover of destroyers hould be an irramoral vessel; otherwise she would be at the metre of the quite formidable arranment which is now mounted on the destroyers. The one, three, and sky-pounders of the data of Devey and Sumpson have glove pixer to high-vedently, longraings, impld frees of four-back cullber, and the ship that undertakes to four down a quanty armed with such pleces as this must needs earry protective armer of high spunity and reasonable thickness.

#### The Interstate Commerce Commission and Safety on Railroads

MILL is to be latireduced in Courcess girling the Interestant Commerce Commission fail paper to operating condition to the readingly equipment and actual operating conditions of the ratherests of the Patient States so far as they are related to the safety of the travellog public. The full is based upon the suggestions of the officials of the Commission. Its object will be to compete the ratherests to maintain that readyment and routheds at a sufficient standard of excellence, and for run their traings only at mach speeds as are justified by the existing physical condition of the track, equipment, and simula system.

As matters now stand, the Commission is empowered to investigate all ratifords weeks and make such suggestions for the improvement of the tracks and estipment and the methods of operation as it may deem necessary. Beyond this the Commission cannot go; its recumentations are not obligatory upon the ratiforads it courseds that the ratiforads have ignored its findings, it contends that the ratiforads have ignored its findings in the interest presenting the traveling public, it finds itself in practically the same predictment with which it was controuted in the matter of rate making, before it obtained adequate Federal authority to enforce its ratification.

Now it is certain that it bill which seeks to confer input the Commbision such far-reaching powers as this will be met with the strongest opposition, multip on the ground that it places in the hands of a few men the power to impose upon the railronds expenditures for roadbed and equipment which might prove to be interesting the provided of the provided provided in interesting the provided in the provided provided in the interest provided and explain the provided provided in the interest provided in the provided provided provided in the provided p

The Importance of the bill and the grave consequences which would follow from a too soulous exercise of the powers which it will confer, are not be dealed, as will be sew-from the fact that if the Commission, exceeding its enlarsed power to the full extent, should order the rallwoods at once to replace all woods and several power to the full extent, which is not the property of the property of the power o

The fundamental principle of the Interstute Commerce Act of ISSN vas that facts, regulations and practices affecting interestate transportation should be reasonable and just and devoid of an unduc and unreasonable discrimination. Subsequent legislation strongthoned the hands of the Commission by giving it the power to cuforce its suggestrous and impose possibles in 1903, during a concressional investigation into the relations of curriers to the coul and oil badness, an act was passed increasing the power of the Commission to regular interstate consucree and conferring upon it authority to prescribe for the future just and reasonable rates, regulations and practices. During the period from 1887 to 1906 there were fitted with the Commission 188 claims, and between the passage of the Hepsium Act of 1906 and the year 1911, \$135 compilities were field, and 2,900 declatons were rendered.

We commend to our residers an article written by Judge Judge of Clements, then chairman of the Interestate Commerce Commission, which impeared in the SCHATTHE AMERICAN OF JUDGE 1891. The facts takes given are taken from that article, in which the Judge went on to say that, up to that time, 220 crimal prosecutions had been indituded for violations of the act, and about three quarters of a million dollars in these had been collected from guilty shippers and carriers. Reparations, aggregating over \$2,004,000, had been ordered in format converted cases, and over one million dollars had been allowed upon the application of carriers on submitted for an analysis of carriers on submitted for an an admitable impaires

The passage of the Intertatie Commerce Act of 1887 was streament) redsted upon many grounds, constitutional and otherwise "It was aliceed," says Judge Clements, "to be radical, revolutionary, un-American and or ningdatable interference with the freedom of contract and with nucleut commercial usages." Nevertheless, we doubt if to-day anyone, either Inside or outside of rullroad circles, will deay that the work of the hierotatic Commerce Commission has been of Inselfan bide beautiful his to the rullroads and the public at large.

It is scarcely necessary to state that the movement of strengthen the hands of the Commission for strengthen the hands of the Commission for strengthen the hands of the Commission fallows the so or three veers with the New Haven Rallowan to its catesaw to secure certain physical changes in the instances of the condition of the condition and equipment which, in the quintin of the Commission, were necessary to neveral such first seekens as have under that read notorious. It is recent understand and, indeed, the Commission in its recent report has made it elever, that if the relition decompany had made certain hapro-emeants, both in the malaronized and operation of list rands, some of the later accidents, in all probability, would not have occurred. The Commission suggested these changes to the company, and their its power cessed. It lacked the Federal and the Commission underset is industry as a matter now stand the Commission that it is power crossed. It lacked the Federal and the Commission will be able to investigate, draw fits conclusions and enforce its mandates.

The excellent record of the Commission in its hand-

ling of the rate situation is an answar to the objection which is sure to be raised, that the peacege of the bill may sudject the railroads to the imposition of obligations in the way of wholesale betweeness and improvements which will be ruinous to their prosperity. There is nothing to justify such a fear. Federal control of the physical equipment of railroads, so far as it has been exercised in the past, has been marked by forbearisme and just discrimination. This was shown in the matter of the enforced equipment of trains with altrinkes and automatic couplers. Whenever a railroad proved to the Commission that its financial condition was such that it required more time for carrying out the Commission's mandate, the time was allowed; and we have every reason to believe that the same spirit of fairness will govern the Commission in the matter of roadbed and rolling stock and the proper adjustment thereto of the speed of trains.

#### Bomb-dropping in the Balkans

T is even yet too early to give a detailed or critical account of the part that bomb-dropping played in the war against Turkey. Enough, however, has been learned from the reliable discussions which have appeared in the technical press to confirm the conclusions reached lone again by military men

sluns reached long ago by military men.
The question of bomb-dropping must be viewed from
two aspects. What is the effect of the dropped bomb?
Can the bomb-dropping avlator fly sufficiently high to
escape an ouemy's bullets and still drop explosives accurately?

Experience in the Baikan campaign seems to show that the moral effect of an exploding bomb that falls from the sky is greater than its natural destructive effect; also that a height of at least 4,000 feet must be maintained if the bemb-dropper is to perform his task in safety.

Thus un December 15th, 1912, Montonests, on a flight from Trevers to Janins, three bombs from a height of from Trevers to Janins, three bombs from a height of 5,000 feet and created a panic; but the fabric of his wings was panicared by boulter builters, on that he made-his seeape not without difficulty. Another Greek, Capt. Barres, was reacted by builters even at a height of 6,000 feet, but he too made good his seeape. On December 22nd, 1912, Moutonesds three builts from a height of 0,200 feet at Janina with good effect; just again his machine was hit is builters, without teleng crippled. If machines can be struck at such heights, the aviator escapes only by the luckteet chance.

A responsible witness, the English filer Hodley, who was with the Bulgarfans before Adrianophs, testifies that one of the many minurets of a mosque was destroyed by an acceptance bomb dropped from his machine. This speaks well for the destructive power of the light bombs curried by aeroplanes. On the other hand, the hit was a strike or luck. It was not even not, the hit was a strike or luck. It was not even nothing the property of the control of the property of the control of the property of the property

If the Balkan experiences teach anything, they teach the impurionce of aeropiane bombs lies in their mansl effect—in the impression created that the machine in the sky is a real source of danger. It is conceivable that in a kind of hand-to-hand fight (the machine buxefug the ground and depending on speed for its safety) bombs might become very formidable. But at great heights the machine gun is superior to the bomb.

There are several obvious reasons for this superiority of the yan over the bumb. It is clear that if a bomb is to be drouped accurately, the pilot must fly almost directly over the target and exposs blueself to the long point-blank range of high angle infantry fire. If the marksomen are good lie may be brought down. But if a machine gun is mounted in the servolance and the variator relies upon it instead of upon bombs, he may keep well to one side of his target. Circling around how lill quickly get the range. Wher is snown, he has all the advantage of noting the effect of his bullets from a great elevation, as advuntage much covered by artillerists and infantry officers who experience the greatest difficulty in sevening exactly where their ministes strike.

That the day is not very far distant when machine guns will be mounted on seroplanes was clearly indicated at the recent Parls and London expositions. On both of these occasions very large hiplanes were exhibited with machine guns mounted in very advantageous positions. The wespons were carried in the foremost part of the hiplane in the nose of the pointed car, so that they could cover the entire field in front of them. In that position, however, they could not be used at all against an aerial pursues.

Apart from the greater accuracy which can probably be attained with machine gun fire, bouths my become a source of danger to the machine in which they are carried. If the fire of an infantry regiment or two be concentrated on an eroplane there is a chance that the explosive freight may be struck, with disastrous requist. There seems to have been some inkling of this danger in the Balkans, for French pilots before Adrianople refused to take bonds absorts.

MAKEN SERVE BEAUTION

Essevisight Projection.—Some suggestive experiments have been made on German warships with lighted projecties, which it is thought may take the place of the electric searchlight. The projection, which is filled with calcium earbide, is fixed from a canson, and since it is lighter than water, after striking, it comes to the surface. During its immersion, water is automatically admitted, and produces acceptione gas, which burns with an itumination equal to that of three thousand candles. The placing of a few of these around, a distant enemy would certainly put him at very serious disadvantage.

The Assouan Dam on the Nile can be called upon to The assessant loss as the true can be esticed upon to furnish a large amount of hydraulle power for operating an electric plant; it is estimated that it would furnish no less than 150,000 horse-power. During five months in the autumn and winter the water of the Nile no-cumulates in the dam, and when it overflows the height of the resulting fall and the great volume of water would. furnish some 150,000 horse-power. Current could be used for the manufacture from the atmosphere of nitrogenous products for use as fertiliser. This would be of great value to the country, for it is stated that Egypt imported no iess than \$3,500,000 worth of fertilisers

The First Passage of the Panama Lock.—On September 20th the first passage of the looks at Gatun, Panama Canal, was made by a sugboat. The water in Gatun Lake was 65 feet above see level, or 20 feet below its ultimate level. The upper look was filled above in the forenoon, and in the Abertsoon the water was admitted. forencon, and in the afternoon the water was admitted to the middle and lower looks. At 4445 P. M. the level in the lower looks having reached the level of the Atlantic, the gates were swring open and the tug entered, the historic event being heralded by the observe of the assemblet thousands. At 1645 P. M. the tup passed from the upper look to Gatun Lake. The test was made slowly and with complete success.

Twelve Years Experience with Automatic Stops.— The automatic stop has had some twelve years of trial under various conditions, with the result that four municipal rapid transit systems have them in auti-factory operation, and three of these, after demonstrat-ing that the stop increases both the safety of traval and the traffic capacity of their systems, have exand the traffic capacity of their systems, have ex-tended their use. The finest performance is that recorded in the New York city subway, where the stop makes it possible to run trains under a headway of one minute and forty-three seconds. The automatic stop is a teli-tale upon careless or inefficient motormen, since it affords a record of the fact that a signal has been overrun.

Noiseless City Streets .- There is coming into use Noiseess City Streets.—There is coming into use in Germany a chesp and ready method of amphalting a stone-paved street which is showing good results. The spaces between paving blocks are cleaned out to the depth of about an inch, and then a layer of melted asphalt is flowed over the street surface, the depth of the layer being about one inch. Before it is cooled, sand is sprinkled on and the surface is smoothed. At Frankfort a section of this kind is now laid, and it appears to stand the wear remarkably well. Should the method eilent means for deadening the noise of city traffic at a small expense. It is quickly carried out and it need not stop the circulation on narrow streets for any length of time. Moreover, repairs are easily made.

Successful Gaseline Locomotive.—At the Schneide mines in France there are being made trials of a new light locomotive with a 70 horse-power internal combustion engine. A novel feature is the use of naphthaline as fuel, employing a special carbureter. It is claimed that the present locomotive is the best solution of the problem of a small locomotive for use with trains on a narrow-The trials made near Havre gage ranroad. In the trans made hear navve sould excellent results as to general working as well as fuel consumption. Advantages over steam locomotives are: rapid starting, no boller upkeeps, suppression of water supply along the road; ease of driving and absence of danger, reduction of dead weight to the least amount, small bulk of fuel on board and absence of smoke and

The Forty-thousandth Lecometive.-Bhat a firm of builders should have recently completed its forty-thou-sandth locomotive bears testimony to the magnitude of sanda locomotive local testumory to the magnitude or the locomotive-building industry of this country. The Baldwin Locomotive Company, who have accomplished this feat, built their first locomotive in 1892. The one-thousandth was turned out from the works in 1881; and in 1880, the five-thousandth locomotive appeared. and in 1890, the five-thousandth homomotive appeared, to, 10,000 was built in 1892, and No. 20,000 in 1902. It took only five years for the company to build its next 10,000 locometives, and the present year sees the completion of the forty-thousandth, a fast passanger "Pacific" type. This locomotive has cylinders 26 inches in dismeter by 26 inches critics, 80-lank driving wheels, 4,225 square feet of heating surface, weighs 189,500 peptude, and has a treative force of 38,300 pounds. It was built for the Punnsylvania, Railread.

#### Science

Sevey's Generosity.—Ernest Solvay, discoverer of the soda process that bears his name, celebrated the 50th anniversary of his discovery on the 20th ult. by giving more than \$1,000,000 to educational and chartable institutions and to the employees of his firm. The universities of Paris and Nancy each received \$100,000.

The F-Rays Do Not Exist .- The discovery that was announced of a new series of rays, the F-rays has just been contradicted. According to very precise and detailed information published by the Eclair, it appears that the results obtained are not at all conclusive. The F-rays appear to be an illusion similar to that of which the scientific world was a victim when the pnyacust Blondiot, professor at the Faculty of Nancy, professod to have discovered the N-rays. tific world was a victim when the physicist

Fermentation in the Paper Industry.—Among the recent improvements in handling paper making materials is a process for extracting the starch from cotton rage that are used in making linen papers. Practically all cotton cloth has some kind of a filler, and much all outton cloth has some kind of a filler, and much of this is starch. In dispings from new cloth there is a considerable amount of starch filler. It was the practice formerly to soak the rage in warm water, and then to boil them in an alkali solution. But the effect of the alkali on starch is very slow, as it causes the starch to swell up, so that the solution reaches the inner part of the starch grains only with difficulty. Malt is added in the proper amount to convert the starch into a soluble sugar which readily dissolves out of the filter of the cloth and leaves it free of the filler. The active principle of the malt is the "enzymes" that attack the starch just as they do in the brewing process, and convert it into a form of do in the brewing process, and convert it into a form of sugar that is easily disposed of.

Delavan's Comet.—A telegram received at Harvard Observatory from Capt. J. L. Jayne, of the United States Naval Observatory, gives the following position of Delavan's comet as observed by Burton:

Relavan s comet as observed by Burron:
September 27.7204 G.M.T.
R.A. 21h. 50m. 37s.6
Dec. —I deg. 37 min. 33 sec.
The following position received from Prof. W. W.
ampbell, of the Lick Observatory, is from an observation by Prof. Aitken:

September 27.7201 G.M.T. R.A. 21h, 50m, 38e,5

R.A. 21n. 50m. 58a.5 Dec. —1 deg. 37 min. 36 sec. A telegram from Prof. A. O. Leuschner, of Berkeley, alifornia, states that Nicholson and Miss Kidder find elavan's comet identical with Westphal's by inter-Delayan's comet identical with weappung polation applied to the ephemeric given in Astronomiss Nachrichten No. 4619. The period is 61.121 years.

The Death of Professor J. R. Eastman.—Prof. John Robbe Eastman, the astronomer dued at a pravate hospital at Franklin, N. H., on Reptember 20th. He was 77 years old. Prof. Eastman was an assistant at the United States Naval Observatory at Washington from 1961 to 1805, and professor of mathematics since then He was retired for age in July, 1898, with the rank of captain. In June, 1906, he was promoted to the rank of rear admiral. Prof. Eastman was the first president of the Washington Academy of Sciences and was in charge of the mendian ornel work at the observatory from 1874 to 1891. He was also in charge of the trainst of Venus party at Codar Keys, Fla., in 1882. Prof. The Death of Professor J. R. Eastman,-Prof. John from 1874 to 1891). He was also in charge of the trainst of Venus party at Codar Key, Fla., in 1882. Prof. Eastman prepared and edited the Second Washington 80,000 observations made at the Navial Observatory, 1889-91. He was the author of "Trainst Cruef Observa-tions of the Sun, Moon, Planets, and Comets," 1903.

Neujmin's Remarkable Comet.-Neujmin's comet resumms a semarance Comet.—Neugmin's comet has aroused not a little interest among astronomers. It was discovered on September 6th last, five days after Metcall's comet. From prate sources we learn that the period of 25½ years, calculated by Einarson and Nicholson, is probably correct and that the object that the period of 25½ years, calculated by Einarson and Nicoholoson, le probably correct and that the object is really a comet, although a very queer one. It was discovered in the Crimes, where the Pulkowa Observatory maintains a station mainly for the observation of asteroids. The object was found on one of their photographic plates and was at first supposed to be an asteroid, as there was no evidence of nebulously. The discovery of new asteroids is not sabled to America, but the discovery of new comets is no cabled. When notice of the object as an asteroid reached Bergersdorf, near Hamburg, Germany, it was observed visually, and it was decided to be a comet. Then it was that the news first reached America by cable. Viswed in the great telescope of the Yerkes Observatory, the object indeed appears like an asteroid. Bence the object in nearly all nucleus. Were it not for the presence of the lineaughtubes it from an asteroid. Hence the object in hearly all nucleus. Were it not for the presence of the longate funds as the stacklike appearance of the object might easily missed even a practiced astronomer into taking it for an asteroid. The comet is bardy visible in a five-inch telescope as a small faint haze. The exame it is a five-inch telescope as a small faint haze. The exame it is a change on a sure of the named eye.

#### Aeronautica

A French-German Air Treaty. - The Luneville incident has resulted in a convention between France and Ger-many, which provides for the future landings of aircraft in the respective territories of the two countries In case military aircraft in distress are driven over the territory of the neighboring country, the pilots are to hoist appropriate signals and to descend as soon as

Harnessing the Flying Machine. Thomas William Carey, of New Orleans, La., has secured a patent, No. 1,070,011, for an aviation apparatus which includes a circular trackway with upper and lower tracks and a flying machine held to the trackway and guyed to pre-vent irregular movements. Some of the guys extend fore and aft to prevent pitching and others extend trans versely to prevent canting or rolling.

Airship Starting Reservoir Acts as a Float .- A patent, No. 1,070,576, has been issued to F. B. Bell, of El Paso, Texas, for a flying machine in which the gas engine is started by air from a reservoir for compressed air and the ervoir is located in the lower part of the machine so it can serve as a pontoon when the machine descends upon water. A series of tanks form the reservoir, and an air compressor driven by the engine compresses

Moreau Wins the Bonnet Prize .- On September 24th, Moreau with his self-raping scroplans won the Bonnet prize by flying half as hour without touching the levers. Lieut. Lafon accompanied him as a passenger to verify the performance. It is said that a strong wind was blowing at the time, that the monoplane rolled and pitched, but invariably returned automatically on a level keel. The SCIENTIFIC AMERICAN has fully de-scribed and illustrated the Moreau machine

The New German Zeppelln "L.H."—The Zeppelln works have completed the "L.H." Sho us and to be a far after type than the ill-fated "L.I." Her exact is 641 feet; in other words, also is 10 feet lower than the "L.I." Her breathth is 40 feet. There are three cases, two of which contant the ungrane, while the third is intended for the officer in charge. The total engane is 400 feet. The New German Zeppella "L.H."-The Zeppelin is intended for the officer in charge. The total engine power delivered by the four motors of the ship is 800 horse-power. It is hoped to attain a speed of no less than 75 miles an hour with this vessel.

A Wind Deflector for Wings .-- M. Constantin, a well known designer abroad, has applied the princip of the "saute yent" or wind deflector to the wings an aeroplane, and it is said that surprising results have been obtained. The deflector comprises places forward of the wing and curving upward toward the rear in such a manner that the wind is deflected up and away from the wing. Thus the wings of the aeroplane are protected from the direct force of the wind on their upper surfaces. The object of the device is to increase the rarefaction of air above the wing, thereby increasing

A New Airship Type.—The airship "Veeh I," which made its first ascent on July 8th, last, at Düsseldorf, embodies some new principles in its construction. The attempt has been made to combine the merits of rigid and non-rigid systems. A steel tube framing covered with fabric runs from the bow to the stern beneath the gas bag and is of such proportions that it contains the cabin and serves as a passageway. This keel frame, for such it is, houses two 130 horse-power Merwedes motors, the pilot's cabin and the passengers' cabin. The vessel is driven by four wooden propellers carried on outragers. A large vertical rudder and a horizontal rudder are mounted at the storn. The cutre level frame can be very quickly detached from the curvelop gas bag and is of such proportions that it contains and separately transported. The vessel is 80 meters long, 30 meters in diameter and has a capacity of 8,000 meters of gas.

The Gordon Bennett Race.—The race for the Gordon Bennett trophy was won this year by Maurice Prevent. Because there was only one foreign competitor, a Belgian named Crombez, the race was really a contest among Frenchmen, and hence aroused but little interest. For all that it was a remarkable competition, chiefly beuse of the record-breaking speeds attained. Maurice evest covered the course of 124 77 nules in 59 minutes 45<sup>§</sup> seconds. His average speed was more than 125 miles an hour which is more than two miles a min-That is the fastest speed yet attained in a flying machine. There were two other French competitors besides Prevost, namely, Engene Gilbert and Emile beauses Prevost, namely, Jugues unitert and Emite Vedrines, also broke all speed records, but he finished nevertheless 1 minute 54 seconds behund Prevost. Crombez, the Belgian, finished last, his time being 1 hour 9 minutes and 52 seconds. There was not much variety in machines. Prevost, Cilber and Crombez flew Deperdussins, and Vedrines a Ponnier Prevost. Oilbort Prevost cut down the surface of his wings until they revose out down the surrace or his wings until they were only 96 feet square. There can be no doubt that this helped him to make speed, but it also made landing dangerous. He flew at midday and kept rather low, rarely exceeding an elevation of 35 feet.

# The Biggest Flying Machine in the World

The Remarkable Biplane of Sikorsky

SCIENTIFIC AMER was called to the gignotie biplane which was designed by Sjkor sky and which flew for just over on hour with seven passengers at St Petersburg

According to a detailed descrip tion published in the Zeitschrift fur M o to t luftschiffahrt, Sjkorsky's machine follows the general lines biplane of 11 Farman Sjkorsky's is the biggest flying machine that structed and flown. It has a span of 28 meters (91.86 feet), and a length of 20

meters (05.6 feet). The supporting surfaces have an area of 120 square meters (143.52 square yards) The lower plane has a span of about 51/2 meters (18.04 feet) less than the upper plane

The machine is driven by four motors of 100 horse-power each, mounted on the lower plane Each motor drives directly a propeller of 2.6 meters (85 feet) diam-The propellers are tractor rotating in front of the supporting sur faces and the motors, so that a cooling blast of air is directed against the motors and radiators

The starting and alighting gear is very stoutly built. There are four landing skids-two long ones in the middle beneath the boat body, and a short one on uch side beneath the lower plane. wheels on which the machine is carried hetween the skids on each side. The wheels are provided with very heavy pneutires inasmuch as the s over 2,700 kilogrammes the m tionnds) unloaded and about 3,200 kHz. grammes (7,054 pounds) with passengers, fuel, etc. The axles of the two pairs of wheels are secured to short skids which are provided with two brackets to the preper ends of which two rubber straps are fastened, thus providing an elastic con-nection with the main skids. The short skids are connected on either side by cables with the wheels, and the wheels in turn are fastened by rubber straps to the skids so that they may yield laterity. The tail consists of a single surface and

elevator combined, above which two verti-cal rudders are arranged. The supporting surfaces are provided with flaps or In addition two vertical surfaces,

one on each side, are mounted below the upper surfaces about six meters (1968 feet) from the central axis These surfaces measure about 1.6 meters (5.24 feet) square

The pilots and passengers are comfortably housed in a calin, so that they are well protected from the wind and weather. The lower part and the floor of the cabin are covered with sheet steel, as well as the front portion of the boat body Celluloid windows are provided. The seats are arranged di three rows behind one another. The two



This huge flying machine recently flew for just over an hour with seven passengers.

front seats, between which is a sageway, are occupied by the In front of each pilot is wheel to operate the elevating rudder and ailerons respectively, and a foot lever to control the

vertical rudders Each motor drives a tacho-meter through the medium of a flexible shaft. The four tachoeters are mounted in front of

ficult to keep all four motors run ning at the same speed, Sjkorsky intends to use a connecting shaft, which will be thrown into engagement with the motor shafts by means of beveled gears. By means of clutches a po

es a pair of motors can be thrown in or out; for example, the two outer mo-tors or the two inner motors.

tated in Front and two bear found, however that by arranging the propellers in a row perpendicu-lar to the line of flight, greater efficiency was obthe motors are thus more readily cooled. It is said, however, that the motors will be motors will be brought nearer the boat body and between each pair a c c ommodations are to be provided who can watch them during

In the after portion of the

cabin, a wireless telegraph transmitter and receiver have been installed. The antenne extend over the main supporting surface and back to the tail.

The cablu is so spacious that several persons can easily be accommodated. It is even possible to manipu-late a machine gun and two acetylene searchlights. The speed of this gigantic flying muchine is about 90

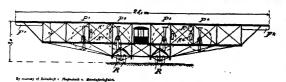
The speed of this grantic nying michine is about 90 kilometers (56 miles) an hour. Nearly every Russian record has been beaten by this machine as well as the world's record for seven passengers. On August 1st tho machine few with seven passengers for over an hour. With twelve passengers the machine has flown

for more than 15 minutes. The Russian ministry of war has bought Sikorsky's biplane and intends to build more like it. While the machine has flown very suc-cessfully, some difficulty has been experienced in launching and alighting; for a enced in launching and slighting; for a large open space is required to start and land. Indeed, the machine must cover about 200 meters (605 feet) before it can get into the sir. Moreover, the prelimin-ary run must be made on very firm ground. In sand and plowed land the wheels sink too deep. Because of these difficulties the running gear has been changed. Four wheels are now mounted on either side in pairs behind each other, so that the machine has in its present so that the machine has in its present form eight wheels. The supporting sur-

form eight wheels. The supporting sur-faces are made in parts so that the entire machine may be more readily stored. The biplane is built chiefy of steel tubing and wood. The supporting surfaces are covered with cotton fabric impregnated with a special compound. The rear portion of the fussinger is also covered with impregnated fabric. Because of the great weight of the flying machine a slight shifting of the load (130 pounds) does not disturb the equilibrium. cently the passengers have a certain amount of

Sikorsky, the designer of this remarkable craft, is said to be only 23 years of age. His interest in aeronau-

tics was aroused when the aeropiane made its first suc-cess in 1996. He started in by designing a headless biplane, and followed this machine up with other aeroplanes of both the monoplane and biplane types. Eventually be went to types. Eventually be went to France where he made a thor-ough study of French aero-plane practice. Beturning to Russia he began building maagain on his own acmall military machine which low exceedingly well



Figs. 1 and 2.—Sjkorsky's biplane. Top plan view and front ele

Ps to Ps, propellers and motors; K: to Ks, radiators; R, pneumatic tired wheals; P, ing radder; R and F, vertical radders.





Eighty-ten derrick with which the girders were raised. Note the guaset pietes on the columns that are to support the girders.

Forty-ton girders bridging the old building.
The first hanger in place.

# Constructing a Building Upside Down

A Seven-story Building Suspended Over a Twelve-story Structure

N EW YORK may boast of some astonishing achievemants in structural engineering, but few are more extraordinary than the hanging building of the Coasolidated Gas Company. This is a 7-story structure suspended between two 19-story buildings over one of 25 stories that was not originally designed to take any additional load upon its own columns. The circumstances that led to this odd piece of engineeting are interesting. For many years the company had owned an old building on the corner of Fiffeenth Street and Irring Place. It had how outgrown the

The decrumstances that led to this odd piece of entineering are interesting. For many years the company had owned an old building on the cerner of Fifteenth Street and Irving Flace. It had long outgrown the building, and various departments had been housed in neighboring offices. It was decided a few years ago to tear down the old arrecture and build a more commedican one. In order not to disturb the office work during the construction of the new building, the old building was not torn down until after a new 12-story building had been exceted on a lot immediately to the east of it. The 12-story building was receded in record time by the engineers of the company. Work started in November, 1910, and in alx months' time it was ready for occupancy, after which the old building was torn down. Before work had commenced on the old site more property had been acquired to the east of the new

Before work had commenced on the old site more property had been acquired to the east of the more building, and sales to the south of the old building on Irving Place. It was then considered advisable to here all the gas companies of the consolidation in one central building, but this would require more floor space than could be afforded by a 12-story structure over the

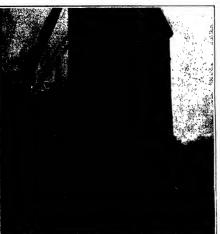
than could be anorated by a 12-story struc-entire property. Accordingly it was planned to carry the building up to 19 stories. But in the middle of the property was this new 12-story building, whose columns had not been designed to support any additional stories. To be sure the columns of the building could be strengthened, but this would necessitate ripping away the walls built about them, which would seriously interfere with, if it did not actually interrupt the work in the offices. It would be possible to bridge across the building with heavy girders and carry the structure from there up; but these girders would have to be 8 feet deep, which would mean that the rooms on that floor must necessarily take the form of hallways be-tween the girders with small windows ar the ceiling. Furthermore, the appearance from the outside would be architecturally bad; the break in the design could not very well be concented. According to was finally decided to carry the br ross at the very top of the structure and om at the very stories from it, the col-pend the seven stories from it, the col-pend of the new 10-story building on each being made doubly strong to sup-t the additional load. This called for form of construction that was per d from the top down

strended from the top cown. Engineers are accuratement to ment the unsupercied, and while this problem was unique, it presented no very certous difficulties. The exterior of the building was shelping if it if it. It. Hardenburg, but the manufacility is not in the contraction of the building was shelping if it is in a planning and

SERVICE CONTRACTOR OF THE STATE OF THE STATE



Method of attaching the hangers to the girders.



Time-saving method of transporting coke.

is now being carried out by the gas company's own staff

—Mr W Culien Morris, engineer of construction, assisted by Mr A W Stark and Mr. II W Airich

In order that no break might appear in the architectural design where the new building joined the now "old" 12-story building, it was necessary to expose the columns at each side of the old building, and bring the new 13-story columns in contact with the old ones. Thus the pillars at the junction of the old and the new suildings would not be any white than the older billars.

The axis sharily columns were exected to support the girders staming the old building and to carry their share of the new construction. The girders are stranged in pairs at the construction. The girders are stranged in pairs at the construction of the building, where the span is 62 feet. There was not these bong stricters are such at the reast, where there is a well in the building, the span is only 42 feet, and here shape girders are used. The first pair of girders is supported on a based level than the rest. The front columns are cusped with the first the columns are comped with their These are further supported by the property of the property

when are supported it story angure are uniques, beavy wing plates reliable with gausst plates. The larger gladers weigh 40 tons, and are 8 feet deep. There is almost 1½ square feet of metal in their cross-sectional area. They were lifted to the ton of the building by a large deer(the of 88-ton capacity. The enormous boun of this dictrick, 72 feet long, any

he seen in one of the photographs. It took 23 minutes to holst a girder from the street 250 feet to the top of the building

The accompanying drawing shows the method of attaching the hangers to the gliders. A pair of girders may be seen at .t 4, both broken away so as to show the construction Between the girders is a dhighragm B, and riveted to this on each slde, back to buck, are two channel from ('C', which constitute the hanger. Two butt plates D serve to secure the filler plates E to the channels and the disphragm. In one of the photographs the first hanger may be seen suspended from a girder. will be observed that the cover plate of the hanger is cui nway at intervals in order to lighten the hanger. Unlike the sary columns the hangers are under tension instead of compression, and they do not need a cover plate to prevent them from buckling The structure is now near ing completion The stonework has been ing completion. The stonework has been carried up the face of the building, and there is nothing to show where the new joins the old. None of the weight of the new structure is curried by the old building, except at the rear, where formerly a large water tunk was installed. To support this water tank the columns here were made doubly strong, and this extra strength was utilized to carry some of the weight of the new structure

One of the photographs shows the lugenious method employed for transporting fuel to the boiler plant.

# Night Attacks in Modern Warfare

#### Shells That Illuminate the Enemy

By Major H. Bannerman-Phillips

A MONG the many nerve-trying developments of the art of war in recent times, night operations are likely to assume great prominence for various excellent To steal a march on an enemy and out maneuver him; to avoid the unwelcome observation of his aerial scouts, planing at lofty altitudes, securely immune from the fire of terrestrial marksmen; to tra-verse ground which offers no cover from the view and fire of the enemy in daylight; to carry on an attack commenced before dark and convert it into a successful fight to a finish during the intervening period before the following dawn reveals one's dispositions, and, more important than all, to take the enemy by surprise, and thus enhance the chances of success ten-fold able to act by night rather than by day, although nocturnal operations are by no means so simple as those carried on in daylight and should only be

attempted by selected and senwho have had special and extended training for the express purpose in peace time They involve a thorough recon-naissance of the ground even in the case of an ordinary night march, and to commit troops to a march or an assault on an enemy's position by night without such a on is to risk playing into the hands of the enemy. In the case of a march by night the route ought to be carefully gone over by the reconnoitering officers both by day and night, compass directions taken and landmarks noted, and unless one has actually carried out such r preliminary double recommissance and taken part in the subsequent operations it is difficult to appreciate how much de-pends on the care with which this duty is performed. In the case of an advance s country with a view to uttack by surprise it is remarkable how obstacles which can be avoided or negotiated with ease in daylight may become veritable pitfalls by night, bringing confusion as advancing troops and possibly which may revent their presence and cause the failure of the whole operation.

In all cases secrecy as to previous intentions and concealment of the operation itself are of the utmost importance. By a well-planned strategical pight march may be out-flanked, or a position enemy may be out-manked, or a position seized which would have been denied and defended by the adversary if he had real that the movement was being made or that the attack was coming A hostile army may thus be placed in such a posttion that the enemy is obliged to fight un der unfavorable conditions, or a com der placed in an embarrassing position by some unforeseen development, may extricate himself by transferring his forces to a distance under cover of the

A hight advance may be used to gain the recoil a ground from which further progress will be made in daylight, the troops being deployed for attack at the outset and not in march order, and in such cases the attack would usually be made as soon as it is light

An assault may be actually delivered during dark-ness, but the hazards of such a proceeding are so great that unless the conditions of a fire fight with the enciny have already proved adverse over the same ground in daylight, or are almost certain to be so, it is usually better to accept the proportion of losses by the enemy's fire which may be expected in a struggle for supremacy under normal conditions by day, trusting to gue and rifle for decision, than to endeavor to gain the point by the bayonet, the grenade, and hand-to-hand fighting, the only methods which can be relied upon in a nocturnal métée. In cases where a night assanir is considered imperative everything is done to avoid alarming the enemy until the attack can close Rifles are not loaded, though magazines are charged and cut-offs closed, the troops are given strict orders not to fire without a distinct order, bayonete alone to be used until daylight makes it possible to aim with effect; absolute silence to be maintained until the moment of assault, the advance to be carried out quietly and without rattling of acconterments. No smoking is permitted, no matches to be struck. If men come across obstactes which cannot be easily crossed or

cleared away they must lie down until a passage can le. If hostile scouts or patrols are encountered an endeavor must be made to capture them withou

en all is said and done it should be extremely diffi cult, even with all these precautions, to surprise an enemy who in view of the various reasons for night operations will presumably be on the londout for such methods of attack. Science will be pressed into the service of the defense and the occupants of a position will most certainly endeavor to turn the tables on their assaliants, converting night into day at short notice by causing the latter to be exposed to one form or another of artificial light at the supreme moment, while they themselves remain covered by the darkness. Star-shells have been found exceedingly useful against savage enemies, but a better illuminant still is the perachute-

Searchlights fired by infantrymen. Illuminating grenades disclosing a charge. Searchagnis ared by minimity men.

An illuminating remnal (flake, petent) is fred from a rifle. Four of the just burst in the air and their lights, 'beld' by parachutes, are falling.'

On the foreground have illuminating greated on their rifles, ready for the petent of the shoulder, but its butt is rested against the ground the regular would be rether too much for the man's shoulder.

light. This is fired from a gun like any other projectile, but of course with only a small charge of powder, and bursting above an enemy, develops into a parachute suspended in mid-air and showing a brilliant light which reveals during several minutes all that is going on beneath

ed and well-equipped force would of conbe provided with searchlights of a portable description in addition to the star and parachute shells. These and admitted to the star and paraceute sacis. These searchilghts would be especially useful to enable the arrillery to play on the assaulting columns with telling effect, and without them the guns would be of little use in defense by night. They would be posted, under the orders of the arrillery commander, well to a fank of the guns for which they are to "make daylight," at of the guin for white day in the protected from the enemy's fire by entrenchments, and would not be turned on until the enemy had been reported as advancing to the attack. As a means of ported as advancing to the attack. llluminating the immediate neighborhood of a positi another form of parachute light, on a minor scale, has been invented. This is in the form of a granade which can be freed from a rife, the but resting on the ground, to ranges of from 80 to 1,000 yards; the floating light burns from 30 to 45 seconds only, according to its sless, but the grenade has the great advantage of being very portable, weighing only 14 ounces, the firing-rod meet with it weighing another 4% ounces. It can be use

in positions and circumstances where either se light or artillery for firing the star or parachute she would be out of the question.

TO THE SECOND OF SECOND SECOND

For the discovery of strategical or tactical night marches it is probable that dirighles, furnished with electric lights dropped by wire from a considerable height and then switched on and off, will be successfully employed.

#### Annual Report of the Commissioner of Patents

THE report of the Commissioner of Patents for the finest year ending June 80th, 1918, states that the fine that time there were of 1960 applications for mechanical patents, 1,869 applications for design patents, 172 applications for relaxes, 7,063 applications for trade-marks, 262 applications for Inde-marks, 262 applications fo

trade-marks, 820 applications for laues, and 344 applications for prints. There were 38,754 patents granted, in-cluding reissues and designs, and 5,166 trade-marks, 664 labels, and 254 prints were registered.

The number of patents that expired was

21,427. The number of allowed applications which were by operation of law fortions which were by operation of any sor-feited for non-payment of the final fees was 6,970. The total receipts of the of-fice were \$2,082,490.23. The total expendis amounted to \$1,924,459.42, and the net surplus over expenditures was \$158,-030.81, making the grand total of net surplus of receipts over all expenditures \$7. 290.103.57

re was a slight decrease in the volume of business during the last fiscal year, the total number of applications for patents for inventions, for designs, for of patents, registration of trade marks, registration of labels, and registration of prints, disclaimers to patents, and appeals on the merits, is 80,084. The total of all applications for the fiscal immediately previous was 81,459 for the same period, which shows a deer 1,375 applications received.

In this, his last report as Commissioner of Patents, Mr. Moore again refers to recommendations which have appeared from time to time in his previous reports and which will be heartly indorsed by every inventor and attorney who is at all familiar with the Patent Office and its administration. Once more it is ursed that a substantial increase be made in the sal-aries of the examiners, and once more the need of larger and more commodious quarters for the housing of the Patent Office is pointed out. "The Patent Office has long since outgrown its present quar-ters, and in its present overcrowded and unmanitary condition is not calculated to inspire or encourage in its employees the

best or most efficient work. The desks se together in many of the rooms, and the ssity for working under artificial light and among dusty files' reduces the average of efficiency among the employees and puts the office at a disadvantage in that

#### Circular Saws of Paper

PAPER is at present used for all possible purposes in the industries and in all possible forms. It has even been possible by means of compression to give it a degree of hardness comparable with stone, so that it can be used as building material. The latest use for paper ever is perhaps the most peculiar. According to a European journal a factory is said to exist in Eugland which is manufacturing circular saws from paper. These paper saws are used for the manufacturing of fine furniture recent These paper saws are used for the manufacturing of fan furniture, veneer and other thin plates of wood, which must be treated especially carefully. Some time age otecular saws made from drawing paper were shown in an English exposition. The saws were driven by an electric motor and produced fus boards, which has been saw the saw of the saws were driven by an electric motor and produced fus boards, which saw the saw of the saw were driven to saw the saw of the saw were driven to saw the saw of the saw of the saw were driven to saw of the saw of

rs made in this way are so smooth that et makers can use them without further

#### Correspondence

[The editors are not responsible for statements made in the correspondence column. Anonymous communications cannot be considered, but the names of correspondents will be withheld when so desired.]

#### An Encyclopedia on the Card Index Plan

To the Editor of the SCIENTIFIC AMBRICAN: Your article on page 213 of the September 18th num her of the Scientific American, on an encyclopedia on

card index plan, is most intere A couple of years ago the undersigned sugg similar plan to a couple of American publishing houses, ne was probably not then right.

It is not too late yet. ARREL G. S. JOSEPHSON.

#### Proposed Method for Clearing Channel or River Bars

To the Editor of the SCIENTIFIC AME

To the montor or the Schemitto American to not appear to be afraid of ideas because they are now or big or even grotesque. So I am venturous enough to make the following suggestion to you:

Why not, below the bar of a river (which it is ed to clear away or through which a channel is to be cleared or kept clear) place a number of pipes or a network of pipes, perforated as necessary. Then (from the shore or a ship) keep up a constant pressure of water (or air), which would cause a constant pressure. at the perforations. I assume this pressure could be

made very great.

By this means not only could deposit of material over a determined area or a channel be prevented, but I think the area or channel could be cleared of deposit. think the area or channel could be cleared of deposit.

The area or channel, once cleared, could be always kept free from deposit.

When an area or channel is to be cleared the pipes or network of pipes might gradually be covered a work proceeds; when the area or channel is once cleared, the pipes would be stationary.

F. C. CONSTABLE, M.A.

Wick Court, near Bristol, England

#### Boiling Volatile Liquids

To the Editor of the SCIENTIFIC AMERICAN:

It may be interesting to note that volatile liquids such as benzine, carbon bisulphide, ether, etc., may be belied over a naked flame with impunity to danger by simply covering the mouth of the receptacle with a wire gause. The gause should be about 20 mesh, and large enough tend an inch or so over the edge of the re

The vapors will pass through the gause and may be lighted (if so desired). The flame will burn above the gause, but will not pass through it and ignile the bulkcontents. If, for any reason, the flame is to be extinguished, then momentarily cover the gause with an nalseaton hoard SPENCER M. GOUDY.

Philadelphia, Pa. [While the method described above might prove very valuable under certain conditions, it must not be considered absolutely safe. It is always dangerous to handle inflammable volatile liquids in the presence of a naked flame, and if the gause should be sufficiently beated by the burning vapors above it the flame would leass through to the vapors within the receptacle. EDITOR 1

#### Grafting Performed by Nature

To the Editor of the Scientific American:
I wish to offer currection of a blunder made by one

of your correspondents in issue of Soptember 20th, entitled "Grafting Performed by Nature." The photo depicts a very common sight all over the West Indies depicts a very common sight all over the west holder and troplead America, including extreme southeast Flor-ida. It is the ficus aurea, or wild fig, which frequently starts in life as an epidendron upon palmettos, mastics or any other tree upon whose trunk the seed happens to be planted by some passing bird. The seed sprouts, and probably assisted by the bird dung, soon reaches the ground with a root, at the same time throwing out roots in the crevices of the bark of its host, and o surrounding the entire trunk. It is not a parasite like the mistletoe, but feeds from its own root system without sapping the bost

#### New Detector for Wireless Telegraphy To the Editor of the SCHENTIFIC AMERICAN

e of the readers of your magazi Thinking that son would be interested in a new detector device for radio work, I submit herewith the following:

mano operators are constantly on the abert for new detectors, or some new scheme to improve the efficiency of those in use. The following is a device which the writer has used with success and which embodies both great empativeless: and ability to withstand heavy status or jarving. Radio operators are constantly on the slort for new

With the fifth of the first of

Using the ordinary detector stand, place a piece of unslybdenite on the lower contact plate and on this molybdenite place a lump of allicon. A firm contact may now be made on the silicon, and when once adjusted will not need further attention.

This arrangement serves for long distance work, and in fact appears to have all the sensitiveness of silicon without the usual inconvenience of constant ad-nt. No battery is required.

Washington, D. C. JOHN S. DEFORMST.

## The Business Side of a Humane Animal Trap

To the Editor of the SCIENTIFIC AMERICAN:

In answer to an article written by George Foster Howell in your September 13th issue, in which he sets forth that there ought to be a humane trap invested to forth that there ought to see a numane trap; invested to prevent the torture of wild animals, I quite agree with Mr. Howell in his idea of the much needed want in the shape of a humane trap to prevent the torture and crueity of wild animals that are caught for their furs

The idea of one spending his money to gain thanks and gratitude from humane people the world over may look quite encouraging to one who is looking for notoriety, but in the matter of dollars and couls it is quite another thing. Inventing a humane irap which would be more expensive than the old steel traps would prohibit the trappers from buying them, unless they pronout the trappers from outling them, unless they were compelled to do so by a national law enacted. Though a humane trap can be invested that would simply detain an animal until he was taken out of 11, without any further torture, probably the trapper would nail them to the cross before relieving them from the

It is one thing to say what ought to be done and another thing to do it. Now to invent a humane trap is a very easy matter indeed, but to put it on a stubborn has very easy matter indeed, but to put it on a student merket is quite another question. Now if the Massa-chuselts Society for the Prevention of Cruelly to Ani-mals or any other body of humans thinkers would put their shoulders to the wheel and see that there is a national law enacted to compel trappers to use a ane trap, I would be one of the first ones to invent

and have ready for the market a trap for this purpose.

Glenbeulah, Wis.

J. Diehl.

#### Flagging at Grade Crossings or of the SCIENTIFIC AMERICAN:

In view of the great number of railroad accidents recently, everyone is interested in measures to reduce the loss of life. The other day a well-known artist

and his family were killed at a grade crossing protected by a flagman. Apparently the fullure of the flagman to properly guard the crossing has not been investigated further than to find out that he carried out his duties

The idea would naturally occur that the means us by flagmen to warn the public were better suited to the former days of slow locomotion than to the rapid rate al which automobiles now travel. It would seem that there is liable to be confusion in the minds of motorisis as to the meaning of the white flag, which the flagman waves as a sign to the public that a train is

white flag is usually understood to mean free-rom danger. Customarily, when a highway is dom from danger. don from anger. Concentry, when a nature, and under repair and flagmen are used to conirol the irrific, the flagman waves a white flag as a signal for the traffic to pass, and a red flag to hold up the traffic. This was the system used on a road near to where the faial accident occurred. It seems to the writer that the confusion arising from a while flag in one place meaning one thing, and in another place meaning just the opposite, may have been the cause of the fatal lent referred to. At any rate, owing to the prevalling uncertainty, some cautious motorists are in the habit of slowing up before crossings where flagmen are employed, and waiting verbal instructions from the flagman before attempting to cross.

It may be necessary to continue to restrict the use of the flags as signals to the engineer, even though the flagman is stationed at the crossing for the essen tial purpose of guarding the public. It would seem, however, that the waving of the white flag might be however, that the waving of the many magning or easily discontinued and the red fing reserved only for cases of emergency. Surely, traffic policemen have no trouble in making themselves plainly understood by simple motions of the hand, and it might be that the flagmen could similarly indicate to the public at the crossings whether it was safe to proceed or not. At any rate, some attempt might be made to improve on antiquated system at present in use by flagmen at railroad crossings, so as to accomplish the purpose of preventing accidents at these crossings. Surely if the preventing accidents at these crossings. Surely if the system of flagging a trail at present in use leads to confusion of the public, instead of becoming a protection, the flagmen might be a meanes and accident continue to occur at crossings which are supposedly protected by flagmen. New Haven, Conn. TRESCRIPE H. LOW.

#### The Ten Greatest Inventions

WillCil are the ten greatest patentable inventions VV of the just twenty-five years? to have your selection We should like

The vote called for in the SCIENTIFIC AMERICAN of Seplember 27th is coming in from all parts of the country. The principal of the Oley Township High School, Oley, Pa., submilted the list of forty inventions to his scholars and sent in their vote. The Editor wants mor such school voles. Scholars will find the question volv interesting. Here is the list taken from a dozen es Interesting snys in the Inventors Prize Contest

Acetylene gas from Kodak carbide Liquid air

Mercury vapor lamp, Monomii Burbank's works Motlon pictures Calculating machines Pasteur's work Color pholography Phonograph Concrele (reinforced). Photo engraving Chanide process. Picture telegraphy. Pnenmutle Hre Dictograph Diesel engine Producer-gas Dirigible. Preservation of sugar-Electric car. producing plants Electric furnice Rudlam Electric welding. Submarine bouts. Transmission and transforming of alternating Firstlen of ultrogen Flexible photo-film High-speed steel. current.

Tungsten lamp Turbine (steam). lamp. Induction moto Welsbach hurner Wireless telegraphy Internal combustion enging X-ray machine

One of our readers objects to the list as follows:

To the Coulest Editor of the Scientific American.

Although not a competitor for vonr "Ten Grentes' Inventions" prizes, 1 have followed the progress of the contest with great interest

Having been in louch with the development of the industrial arts for a unmber of years, both as a member of the Examining Corps of the Patent Office and us a practising attorney, I must say I mm surprised at the list of "Greatest Inventions" published on page 243 of your Issue of September 27th, 1913 Out of the number of essays which were submitted, many must have been good, and I am at a loss to undersland why. In compiling this list, you should have selected as among the twelve best any essay containing items

as among the tweet next any essay containing terms us absord as some of those mentioned.

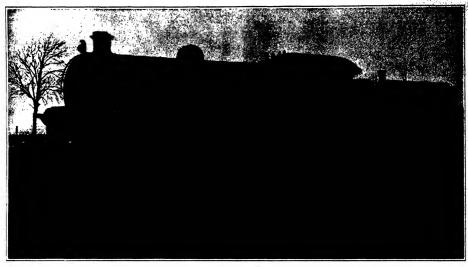
One of these items, the "phonograph," was specifically excluded by the terms of the contest as contained in the original amountement. Several of them, as, for example, "Burbank's works" and "Radium," are not pulentable inventions, and hence not cligible. such as "lucundescent lamps" and "Internal combustion engines," were in use prior to the twenty-five year period Still others, as, for example, "Liquid air" and "Monorall," are of purely scientific interest, having substantially no industrial application. And there is no class of apparatus known by the name "Koduk," this word being merely a trade name used to designate the goods of a particular manufacturer

Il is inconceivable why you should confuse your readers by including such items as those referred to above, which can be aptly characterized as foolish, while omitting such a thing as the modern type-setling This is universally recognized as the most marvelous mechanical inventions of the age. and I happen to know of several contestants who in chided the linetype in their list, without question.

I suggest for your carnest consideration that you examine again the essays submitted, publish a revised list of items, eliminating all "freaks" and including more real inventions, and then ask for the opinion of your readers. This, I believe, would be productive of more satisfactory results. J Hanson Boynen utisfactory results.

Washington, D C Apparently Mr. Boyden has missed the point. The list does not represent all of the essays not necessarily the best of them. Which are the best is a matter for the Judges and not the Contest Editor to decide The selection of essays was unde to show the wide diversity of opinion on the subject - As explained when the list was first published, it includes some which quite cridently are not patentable and some that do not properly belong within the 25-year period, but the voter must decide for himself which should be avoided on that score. Typeselting machines did not happen to be listed in any of the twelve essays, but if in the voter's opinion they are eligible, let him include them and any other inventions of his choice in his list.

Make your own selection of the ten best inventions and send them to the Coutest Edilor before the 18th of October. The result of the vote will be published in the Scientific American of November 1st. This number will also contain the essay winning first prize and the announcement of the successful contestants.



New type of English locomotive.

This incomption, designed at Charlestenburg, has eviluders of double the length of the stroke in which the flow of steam is in the same direction within the same eviluder spaces

#### Interesting British Locomotive Development By Our English Correspondent

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THE interesting locomotive illustrated has recently been introduced into the heavy express service of the North-Eastern Rallway of England, which system. along with those of the Grent Northern and North British raliways, forms the East Const Route from Lon-don to Scotland This engine, built at the railway don to Sotiano Tink eighte, unit at the railway shops at Darlington, has six coupled wheels, and a four-wheeled leading bogle, and it is fitted with the Stumpf "uniflow" or "unaflow" apparatus, according to the designs of Prof J Stumpf, of the Technische Hochschule, Charlottenburg The fundamental feature of the Stumpf engine is the extraction of the energy

stuntly lu one direction from the not inlet ports to the relatively cold outlet In the ordinary steum engine, the flow is of course, reversed at the stroke and each exhaust stroke During the exstroke During the exgines the clearance space surfaces are cooled down by the cold wet steam, and as a result the next incoming volume of hot live steam suffers considerable initial condensation In the Stumpf engine this cooling of the clearance surfaces is avoided, with the result that initial condensation is almost entirely absent. Hitherto the avoidance of the initial condensation has been attempted in two different ways, namely, by superheating and by compound ing. In the first the steam is heated above its evapor ation point to such a gree that the cooling effect of the eximust steam is no sufficient to lower the tem perature of the steam to the condensation point. In compounding, the endeavor is to reduce the range through which the tempersture in each cylinder

for the Stumpf system that it removes the necessity for superheating, and that in a single expansion stage its steam consumption does not exceed that of compound and triple expansion engines. The exact form given to the Stumpf cylinder differs, of course, according to the nature of the engine for which it is intended. In gencrei, however, it is double acting, with an inlet port at each end and a common exhaust port at the center. The exhaust port is constituted by a series of holes drillied round the walls and leading into an exhaust belt formed integrally with the cylinder casting. The piston employed is of exceptional length and fills ap proximately half of the cylinder volume. In fact, at In fact, at the end of each stroke one or other of its edges is just clearing the ring of holes and allowing exhaust to take place. It is thus clear that each half of the cyli

volume has to deal with the steam from only one inle port. It will also be exthered that as the total area of the exhaust port is large the period of exhaust extends from a short time before the end of the stroke is reached until a short time after. The bulk of the one stroke is thus occupied with the admission and expansion, and the bulk of the other with the compres soo, and the bulk of the other with the compression of the steam. The period of exhaust covers one tenth of the stroke each way, so that admission and expansion occupy nine tenths of the stroke in one direction and ression nine tenths of the stroke in the other ction. The North-Eastern engine has cylinders 20inch diameter and 28-inch stroke. They are about twice as long as cylinders of the same stroke but of the ordinary pattern. The pistons are hollow castings with spring rings at each end. As already stated, they

act as exhaust valves and uncover the central ports when 10 per cent of the stroke has been completed. The admission of steam to the cylinders is controlled by piston valves placed on top and actuated by



F the development of the submarine in the early years of its existence d to be rather slow such charge can be made egainst this interest. ing craft at the pre time. Within a single de-cade, it has developed from an ingenious curiosity into a potent engine of war, the limit to whose future development no intelligent student of naval affairs would care, just now, defi-nitely to determine.

re is no branch of the naval service regarding which more secrecy is observed than the torpedo service. The official lists of the ships of our navy, as published annually by the department, which for-merly contained rather these boats, now restrict themselves to a mare men-(Constuded on page \$94.)

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ed, 14.5 know. Submarged speed, 10.5 know. Redles of sellow on the

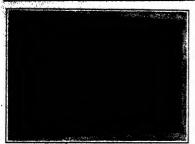






Fig. 2.—A ploneer board which reproduces base-running only.



Fig. 3.—A bulletin board which is little

# Mechanical Baseball Bulletin Boards

#### Reproducing Hits and Plays in Miniature

U NDOUBTEDLY a sight which must amass every foreign visitor to America, are the great crowds of baseball enthusiants clustered the great crowds of baseball enthusiants clustered around the builgetin boards of important newspapers, watching, enthresiad, the posting of the score that indicates the progress of an important game in some distant city. Such is the enterprise of our great deililes, that they are no longer contant with gratuitously posting merely the score by innings, but to reproduce on an animated board the actual plays that are made. For nearly twenty years inventors who realized the enormous popularity of baseball and the commercial success that awaited the man who could derive a simple and efficient way of reproducing the events of a distant game, have tried to meet the demands of the newspapers. Only recently, however, has the demand been mot. It is the object of this article to show some of the earlier attempts which were made to provide realistic builetin boards and then to describe the board which has been mort successful.

make to provide reasonic fluident hours and the medicarithe the board which has been most successful. The buildin board which is shown in Fig. 1 is entirely illuminated and hence is most effective at alght. The positions of the players are patitived on temporareless. Behind self-transparences are patitived on the players are patitived on the players are patitived on the players of the self-transparence of the control of the players are patitived on the blank players of the self-transparence of the players of the self-transparence above, the building board is of as of the building that the players of the players of the players of the standing of the clubs in the lesques to which they belong, the umpires, etc. Some of the information conveyed by the board is of a transferry character, and other information more or less first. Thus the events in the field are necessarily changing constantly, whereas such facts as "Game Playing at New York." "Attendance 23000," and "National League Standing," etc., are permanent. Therefore the inventor has supplied two sets of keys for his switchboard. One set of keys when depressed remains depressed and is used for conveying the more or less permanent information referred to; the other set of keys is retractile, and is used to indicate the position of the ball at any given moment. As soon as the finger is retractive, are retractive, the light which it con-

trols is extinguished. Electric lights are provided not only behind the transparencies indicating the infletid and outfield positions of the players, but also to indicate the location or he ball at every instant of the game's progress. A goog is provided to announce the base hits. When the game is about to commence, the operator at the keyboard lights up the "Score by Innings" transparencies of both citus, also the places for the runs, the club names and players' titles. As soon as he readvise word that the game has commenced, he depresses the key which controls the current to the "play ball" transparency, which is lighted up and remains on until the game is called. When the game is called when he recotres word which silteninates the word "Unpiress" and when he recotres word which of the unpires is to act, he depressed keys which illuminate the unpires should make an error and the single's should make an error and the states. In the state, the setting unpires's should make an error and the

SARSHIP TO THE

name is displayed in green lights. At the bottom of the bulletin board at either side of the center will be noted panels bearing the letters "LF," "CB," "RF," etc., which obviously designate the positions of the players. The names of the players are to be fashed opposite the letters which designate their team positions. Two tables or names are required, one for each team. If the club represented at the left center is in the field and the other club at hat, the operator pushes down the key which it-luminates the name of the player at bat and the position



Fig. 4.—A board in which amali dummies of the players are used.

be holds in the club. As a result a white light is made to fare up. If this man makes an error, the fact is communicated to the spectators by extinguishing the while light and illuminating a green lamp. As the successive players take their places at bat, the keys are operated to illuminate their names in turn and to record

The course taken by the ball is indicated by lamps placed in the field. These ball lamps are under the control of the retractile keys. The course of the ball from start to finish is thus accurately indicated and represented. If, for example, the umpire tosses the ball to the pitcher, a samp right bahind the pitcher flares up and goes out as soon as the ball is thrown If the batter hits the balt, the lamp immediately in front of the batter is illuminated by the depression of the proper key. If the ball should be eaught by the catcher, then the catcher's lamp will flare up. Nimitarly the position of the ball in the hands of the outfielders is indicated, as well as its position when it is batted between two outfielders or infielders. If a player puts out a man rying to make any of the bases or to score, the lamp at the station of the player is lighted and also the lamp at the base where lie man was put out in order to indicate what man was put out and what player put him out.

One of the pioneer basebuil bulletin boards which is frequently cited against applicants for patents in this class of invention, was patented on May 6th, 1880, by Edwin A Grezier and Frank P Anderson 1ts general features are shown in Fig. 2. Along the line of the diamond is a groove in which a number of cords or These cords and endless belts are arranged to run their supports constitute a mechanical conveyer. They pass through the board near one corner of the disond (near third base in Fig. 2) and are worked by handles behind the loard Each cord carries one or more wire clins extending out through the groove in the face of the board and carrying a tag or marker. The various markers indicate the players. By means of the cords the markers can be moved along from base to No attempt is made to show what becomes of bull if it is batted to one of the outfield positions; only the actions of the base runners is indicated.

The aquastrus shown in Fig. 3 does not give nearly we vivid a representation of the actual occurrences on the distant diamond as the devices thistrated in Fig. 1 and 2. Indeed, it is little more than an annunctant The progress of the game is disclosed by means of plates which swing around on pivots, somewhat like the dampers in a stote-pile. The numeral 5 in the illustration under the heading "Batter" indicates clearby enough how the plates turn. A simple train of general driven by a weight, turns the plates. A detent holds the plate in pestion until the numeral which it bears

is to be displayed. The deient is withdrawn by means of an electromagnetic apparatus operated by a key There are as many keys as there are plates

In the bulletin board shown in Fig. the actions of the players, rather the positions of the ball, are resistated by presented Ac our liberation shows, the bulletin board is slotted in The manufacture of the source of the sourc

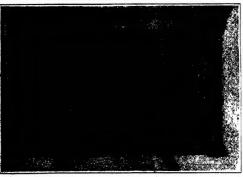


Fig. 5.—Front of the most successful board as it is seen by the speciators.

In Figs. 5, 6, and 7. It is to be found in front of many averagers offices all but hypotating crowds that keep the potent hard presents of a distant game with attached detail and rentism. Indeed, it is not unusual to hear cheers rishing from the assembled "fans," when they watch the induced distillation of a particularly brilliant plan on this simple but linguisous bulletin board.

In this particular board the activities of the base runners as well as the career of the ball are represented, and therefore it is a distinct improvement over the toventions previously described.

Fig. 5 is a front view of the board us the spectators see it. In Fig. 6 the covers N, N', N', and N' have been removed to show some of the mechanism. Fig. 7 shows the back of the board.

Between the bases and the home plate grooves are cut. In these grooves four endless challes B travel over

spreckets. The approximate grown except diameters C, two for every grown except that extending between the home-plate and first base, in which case one player indiction by provided C only one of the two indicators carried between first and second base, second and third base, and third base and the home plate is visible, the other being concealed by the covering strip N, N, or N, as the case may be. The spreckets are driven from a small

electric motor 4, the current to which can be cut in or out by means of the switch F The motive power for each chain is The motive power for each chain is controlled independently from the four keys E As may be supposed, each key controls one chaln and its sprockets in Fig. 6 a player indicator is shown at the lat Suppose that he makes a base hit; immediately the proper key E is depressed, and the player indicator travels with its sprocket chain to first base. Suppose that this player tries to sten! second but is caught between the first a second basemen. The sprocket chain traveling between first and second base is stopped by means of the key E, so that the player indicator remains between the If a telegraphic report is received that the player has reached second, the chain is started again, so that the fudicator is carried to the second base other hand, it is reported that the player has been forced back to first base, erator of the bulletin board turns a handle D, and the sprocket chain carry ing the player indicator is moved back to first Hand operation is necessary in this case because the electric motor always drives the sprocket chains in the same forward direction

Two indicators  $\ell'$  are carried on the challis between all the bases except the home plate and the first base. It will be observed that an indicator be exhibited to the expectators between bases. As soon as it reaches the base toward which it is moved, the operator presents his key  $\ell$ , stops the chaln, so that the Indicator remains in sight covering the base. If the indicator is to be advanced to the next base, it is covered in the next indicator, which promptly status on its journey, the first indicator themperoring behind its covcring strip h,  $h^*$ , on  $h^*$  as the case may be Suppose that all the bases are full. In

Suppose that all the buses are fail. In that situation the players are usually off base. They are held thus by throwing the awitch F which cuts of current from the motor A. If a mun is enight between bases, the bundle D works the indicator lunckward and forward to indicate his prediction.

to his base and disappears, and his misfortune is recorded on the secretosural bin if he succeeds in roughing the base, the switch F is thrown again, so that the motor is again supuled with current. Simultaneously the men on the other bases are advanced in position assuming that noise is put out. From this it follows that the switch F is used primarily when all the bases are h.

The mechanism for reproducing the antics of the ball remarkably fixable. The white balls are employed One of these  $\theta^*$ , a real baseball, moves about on the fout of the beard in full view of the spectators; the other  $\theta_*$  moves about at the back of the beard. The ball  $\theta$  may be called the master ball, and the ball  $\theta_*$  in front of the board, the exhibition ball. Each ball is moved about by the said of three cords meeting at a common point. The cords in frunt of the board are very this and so polored as to harmonise with the back ground. Hence they are not at all visible. The master

ball G (Fig. 7) is attached to the cords, J, J, and J. The exhibition ball G in front of the board is controlled by the cords M, M, and M. The three cords J, J, and J puss respectively over drums K, K, and K; and the cords M, J, and M; controlling the ball G, pass respectively over the drums L, L; and L. The two sets of drums are controlled by counterwights.

drums are controlled by counterweights.

The master hell of at the back of the board is maniphiated by means of the handle H to which it is attached. If the operator is told that the ball has been batted to center field, he simply carriers the master ball G by means of the handle H from the home plate to center field, simultaneously the exhibition ball G in front of the board is moved by its strings M, M, and M in the corresponding direction. Thus every one of the movements of the ball telegraphically reported is duplicated on the board. If the pitcher twirds an outcurre it is a simple matter to show the ball curring out markedly,

3 OUT ALL S 3

Fig. 6.—Front view of the board with covering strips removed to show the mechanism.

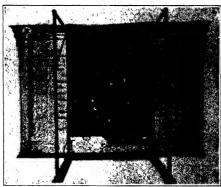


Fig. 7.—The back of the board, showing the method of operating the master hall.

So, too, it is possible to throw the ball with lifelike effect from the catcher to the first baseman or to any position in the field. When the ball is not the operation, the counterweights on the drums drop to their lowermost positions and hold the ball in the pitcher's box.

#### Rapid Telephotography By Dr. Robert Grimshaw

RECENTLY Prof A Korn, whose work in connection will telephotography, or the transmission of photographs by telegraph, is so well known, and who has solved practically the transmission of illustrations and handwritting ever long distances by wite, reed a paper in Vienna on ingrevements made and probable in the fine of rapid transmission over long distances; with the discovering the continuous properties of the transmission of kinematographic dim pictures. The most important preblem to solve is

increasing the rapidity of transmission. This is limited on the one hand by the insirth of the apparatus soot to receive and to transmit; but much more by the capacity of the circuit to transmit the signate of multipless which together make up the picture reserved.

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October 11, 1911

primes wincin conjecture mass up the picture reserved.
For sendings through shert floss the speed which has hitherto been attained about affects inslustes for a picture 13 by 15 centimeters (5.12 by 7.69 inches) can be considerably increased, as the sending and receiving apparatus permit this; but the main advantage in phototelegraphy is the ability to beet the post, which comes into play only on long lines such as Berlin to Vienna, Berlin to Paris, etc. This would permit illustrated papers to print in that morning editions pictures which would not have resched them in time by mail. For this reason there would be no use in trying to increase the rapidity of operation of the sending and receiving apparatus, without having first increased the expectly of the line. This is a marked capacity of the line. This is a marked capacity of the lessending of imberator.

capacity of the line. This is a marked hindrance to the sending of kinematographic pictures, where it is necessary to send a great number of pictures one after another by telegraph in order that they may be assembled at the receiving end in film form.

Working with Herr Bruno Glatsel, Frof. Korn has made the first attempts at transmitting a kinematographic series of pictures; and as a result it appears that where there is an hour at disposal for the transmission of a series of 20 pictures, this can be done.

As the time required for the transmission of a picture 13 by 18 centimeters is 15 minutes, 11 is evident that where much greater speed is required, one cannot expect too much detail—so Prof. Koru has contented himself with a comparatively simple subject—the gestures of an sector. Four of the pictures immediately following each other were brought together on one plate, and this was sent in 12 minutes; so that for a series of twenty such pictures an hour would be taken up.

The pictures received are then arranged in the proper order of sequence, and transferred to a kinematographic film, which enables their being thrown upon a screen as a kinematographic picture.

This permits giving an occurrence which takes place at midday in Paris, in a Berlin "movie" on the next morning; and when the matter is of importance, so that the entire night can be devoted to its transmission, a good kinesactographic representation may be given the next morning.

These experiments also throw light upon the question of whether or not the problem of television or seeing by tele-graph can be solved in the near future. A series of twenty kine pictures takes about 20 minutes of actual occurrence, but for the transmission, at least an hour is mecessary. To send as fast as the actual occurrence takes place would require 1,200 times the present speed of transmission. For this reason, Prof. Korn gives it as his opinion that telegraphic vision can in the present stage of the art be accomplished only by the use of a great number of electric circuits. The principal hindrance to the accomplishment of this desired end is the enormous amount of capital which would be required.

#### The Food and Drugs Act Guaranty Label

IN an, interesting article published in Take Nation's Business by the Chamber of Commerce of the United States of America, Dr. Carl I. Alaberg, chief of the United States Ruceau of Chemistry, Department of Agriculture, calls attention to the futility of the guaranty label. Many persons misconstrue the significance of the label and believe that the labeled goods have been subjected to analysis by the Department of Agriculture. The Food and Drugs Act One on trequire the manufacture to employ the words "Guaranteed Under the Food and Drugs Act" or to place the serial number on this label. The words "Guaranteed Under the Food and Drugs Act" are resuly a guarantee of the manufacture to relieve the customer of responsibility should the goods be proceeded against by the Government.

coseded against by the Government.

Dr. Aleberg suggests the advisability of legislation providing for the denaturing of domestic food substances which are declared until for food end whisting the alipper may declare designed for use whelly in the arts.

#### Electrified Chickens—Electricity as a Grewth Stimulator

By the English Correspondent of the Scientific American

S OME time ago Mr. H. G. Wells wrote a delightful fantasy called "The Food of the Gods," in which he imagines a food which stimulates growth to such an

extent that the dimensions of all living things who feed upon it are increased are or seven times. Mr. Wells probably had no esseption that such a stimulating agent would ever be discovered. But it appears as the result of some very recent pears are the result of some very recent researches, that living beings may be greatly increased in size when subjected to proper conditions. It is true that no superior that the superior that it is true that no superior that no superior that no superior that it is true that no superior that no super

High frequency currents have long been used by the medical profession with hence foal results, but until recently the mere frings of the subject has been touched, Medical mon have been contented with a comparatively limited range of application. It has been reserved for Mr. T. Thorne Islate to show what great possibilities are inherent in the application of high frequency currents to blying things. For some time Mr. Thorne Baker has interest, promise the growth of pacterial and moses, but his latest work, aparl from its scientific interest, promises to have results of great the second of the provided of the provided of the second of the provided of the provided

commercial Importance. The latest experiments are concerned with lie influence of high frequency currents upon the growth of chickens, and they
are being conducted upon a truly coloseal scale.
Meeches Farm, Poole, England, is probably the greatest chicken farm in the world, and is the secue of these
est chicken farm in the world, and is the secue of these
est experiments. On this farm about four thousand
chickens are being grawn under the influences of the
electric waves. The results are truly actualising. The
chickens live in flats and over the whole building is
wound an insalted wire which is traveraed by the
high frequency currents. The apparalus which genetees the high frequency currents presents distinct
see that the outcome of unnerous experiments. Careful adjustments have to be made of the various electrical quanties entering into the circuit, before any offect is produced, but with a project adjustment of the apparatus,
most marked effects occur.

Chickeons living in the electrified flats reach, in five weeks, the normal weight of chickens three months old. And out of four hundred chickens treated in this way only six, and liness obviously doomed from birth, ided. In view of the farct that a fifty per cent deathrate is usual at this period of the year, it will be seen that this result is sufficiently startfling. Chickeons so weak that they could not stand up, and who in the ordinary course would infailiby have died, have been put in the electrified flats and become houlthy and

It is not only that the output of a chicken form is doubled by this process, but a considerable saving in food is effected. Only two thirds of the usual quantity of food is required by the electrified chickens.

The chickens are charged to such a high potential that a spark discharge occurs on presenting a fuser to the beak. From the schentific point of view the most interesting part of this work is the theory which explains Aov. high frequency currents attinuinte growth in this way. Mr. Thorne Buker is of the ophtion that the high requirecy currents attinuinte the blood circulation by lowering the viscosity of the blood. He has conducted experiments on the effect of high frequency currents on the flow of viscous fluids, and he fluids that the time of flow is decreased. The viscosity and losses some of the viscosity and becomes more mobile. It is not at present known whether prolonged elec-

It is not at present known whether prolonged electric action increases growth up to maturity, or whether its whole effect is to cause the maximum size to be sooner reached.

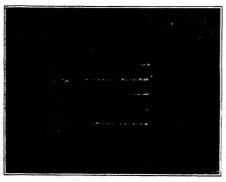
In certain quarters the application of high frequency currents to the growth of children is being contemplated, and the results in this field will be awaited with interest.

It is evident that we have here a method pregnant with possibilities, and its further developments will be rich in interest both in their scientific and commercial

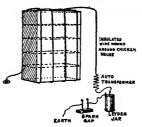
#### A New Language-teaching Phonograph

rgulff phonograph may be considered, in principle at a least, to be an ideal language teacher, but as a matter of fact its use has been very limited for this

purpose up to the present time. The reason why the advantages of the phonograph have not been widely made use of, lies in the fact that the spoken words as recorded upon the disks cannot be used alone for learing languages, at least by the general public, for we must not only hear the words, but have the same words in prints on that they are viable to the eya and at the



The electrified flats in which chickens are raised.



How the chicken house is wired.

same time have the translation into the learner's tongue. Inventors do not appear to have been able to combine a suitable device for carrying this out, and it remained for a well known phonograph and moving picture firm of Paris to solve the problem, with the instrument seen in our photograph as the result. Although very simple in fis idea, the apparatus was by no means an easy one to realize in practice, for what was required was to have a paper strip with the printed words and their translation pass along in front of the learner so that he can see them at the same time he is listening to the



Learning a language in a new way.

same words given out by the phonograph. Then after a little experimental work, a suitable mechanism was devised for currying this out. The paper band unrolls continuously while the disk revolves, and the right word always fills under the motal pointer placed at the center position. Should the device prove to be all that is chimzed for it, it will make a decided step in advance

in the matter of learning languages, for the price is which the reach of all, and it will now be possible to learn any language without the aid of a professor such as was heretofore indispensable in order to have a correct pronunciation ness of the "automatic professor" lies in the purallel action of spoken and printed word, both eye and ear receiving the impression at the same time, so that the memory retains the form of the printed word accompanied by its sound. In prin-ciple there is no limit to the number of languages to be barried by this method. At the start the constructors have brought out disks and rolls for English German and Spanish, but when the device comes into extensive use these will be followed by others. We need not dwell upon the advantages which the phonograph method has over the usual language professor Besides being polyglot, it saves much thus and is ready to be used on any occasion, without any of the usual drawbacks. The simplest form of the device consists of the phonograph and paper roll mounted upon a flat base for placing on a table. How-ever it is most convenient to have a suit-able place for keeping the numerous disks and corresponding rolls, and this can be

done in the more elaborate nymeratus which is seen here. The outfit for the Gorman language, for French learners, comprises two specially-propared language books, twenty-sky phonograph disks with records upon both faces, and fifty-two printed lands, each corresponding to one face of a disk. It is interesting to note that he first elements of music can be learned in the same way, and a set of disks and other material is already leased for this purpose.

#### A Warning Against Fraudulent Radio active Water

THE United States Department of Agriculture, through the Bureau of Chemistry, has besued the following warning to the public in regard to the socalled radioactive mineral waters offered for sale in

called radioactive mineral waters offered for sale in bottles:

"There are indications of the beginning of an attempt to perpetrate a great fraud on the 'uncitan nepole through devertibing certain mineral waters as possessing radioactivity. These waters, in some cases, are then from springs as a certain radioactive properties. Examination of many of these waters by the Department's specialists, indicates link whatever radioactivity they possess at the spring is due almost entirely to radioactivity properties. Examination of many of these waters by the Department's specialists, indicates link whatever radioactivity they possess at the spring is due almost entirely to radio activity. The belief long in which they water has been bottled a short time, it will possess paractically no radioactivity and the belief long into by many leopic that some universal waters used at the springs are more effective than ground that the beneficial effect of these waters is due to radioactivity. As the radioactivity disappears soon after the water is taken from the spring, any effect due to the radioactivity number he lost in a short time. If the radioactivity must be lost in a short time If the radioactivity number is due to regard with suspicion any water advertible and source in the water is the spring. As far as the correlated as possessing radioactivity, as far as the teaching results in the water at the spring, results this water dotting on asverticin, an attempting results have been point to asvertich, and the spring, results thus radioactivity for any length of time. The beginning of the content of the content of the water at the spring, results thus reducently for any length of time. The beginning of the water at the spring results in the radioactivity for any length of the content of the content of the water at the spring results in the radioactivity of any length of time. The beginning of the content of the content of the water at the spring results to the radioactivity of any length of the

bottled water, no matter how radioantive it may make even at the spring, retains this radioantivity for any length of the properties of the control of the c

It is said that 90,000,000 broom handles are used annually in the United States; one for each man, woman and child.

And the state of t

#### The Construction of a One-kilowatt Closed Core Wireless Transformer

Till advantages of closed core alternating current transformers over the rapidly disappearing spark coil and pureliable vibrator for wireless transmission lie in their comparatively simple construction, their



Fig. 1,-Assembling the "leg" of the core.

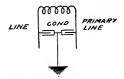


Fig. 2.-Diagram of condenser co ducing static strain in primary.

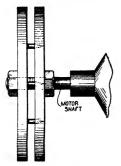


Fig. 3 .- View of the winder

high efficiency, their positive operation and their up standing under severe overload and physical abuse Almost all of the disadvantages from a constructional viewpoint are eliminated, so that the making of a very satisfactory transformer involves only patience and ordinary constructive ability

The inefficiency of the average experimeniers aerial

necessitates the use of a transformer of larger capacity than would ordinarily be needed if all conditions were favorable Under standard conditions wireless sets will ravorable Under standard conditions whreless sets will trainshit labut one mile for every ten watts of energy expeuded. By standard conditions is meant a well insulated nerial that is at least 100 feet above surrounding metallic or conductive objects. Correlative rounding metalite or conductive objects. Correlative with this is ground inviting a low resistance to high frequency currents is necessary. Water and gas pipes contrary to the usual belief do not always fill this requirement, and as the typical amateur's nerial is always more or less poorly insulated and his instruments improperly tuned, his set instead of transmitting one mile per ten watts, seldom averages half of that.

The question of the most sultable size of transfe to build for experimental use, is easily answered. The constructive limit in most cases is reached at the 1 kilowatt size. Dillicuities urise from bulkiness and extreme insulation which is necessary in sizes larger than 1 kllowatt. The cost of materials is an important consideration, and it might be well to mention that a 1 kilowatt transformer will cost bardly twice as much for materials as one of the ¼ kilowatt size. If there is any possibility of interfering with comm Government stations, a lower power should by all Government stations, a lower power should by an means be used and may be obtained by inserting an adjustable water rheostal or a choke coli in the primary circuit. The former type of current regulator be easily constructed by filling a keg with strong salt water, placing, for an electrode, an iron disk in the bottom and raising or lowering another iron disk in the solution. The amount of current allowed to flow will be found to be inversely proportional to the distance that the electrodes are apart.

The transformer will consist of the usual hollow rectangular shaped "closed" core of laminated from wound with a few turns of coarse wire and a large

number of turns of very fine wire. Upon the ordinary house lighting current (110 volts, 50 to 120 cycles) being introduced into the coarse winding, or primary, the magnetic action of the core will cause a current of extremely high potential to be originated in the wind-ing of fine wire, due to the ratio of turns. The great nce of potential at the terminals of the seco as it is called, is suff cient to cause the current to le between them and, if they are held near enough to gether to form an electric are of low density. By shunting a large capacity condenser across the terminals, a crashing white spark takes the place of the noiseless arc. It is this spark that is used in wireless transmission. A high tension conde

cussed in a latter part of the article.

If the transformer is constructed in accordance with
the directions given below it need not be oil immersed.
However, it is a good plan to immerse the transformer
in boiled oil in damp localities, especially near salt

#### Construction.

The core will be built up of annealed, soft iron strips. about No 28 A. W. G. of two sizes, measuring 14 by 2 and 6 by 2 inches, respectively. Two piles each 4 inches d. will be necessary of each size when compresses high when compressed, will be necessary or sach size. Two "legs" or sides of the longer strips should be built up to a height of 2 inches and in such a manner that 2-inch spaces are left altornately at the ends for the 6-inch by 2-inch cross places. This construction is given inch by 2-incre cross pieces. This construction is given in Fig. 1 and may be seen fairly well in one of the photographs. About 50 pounds of iron will be necessary for both sides and cross pieces.

The legs when assembled should be tightly taped and

ould be tightly taped and wrapped with oiled muslin cloth to within two inches of each end and to a depth of 1/4 inch. Oiled muslin cloth, available under the commercial names of Empire cloth and Linonite, when dry will withstand a puncture tes of about 1,000 volts per mil, although under heat and corona stresses it will deteriorate somewhat.

There are two well known methods observed in wind-

ing iransformers. One, by having part primary and secondary wound on each leg; the other by winding the primary on one leg and the secondary on the other The latier possesses several advantages over the form method from a constructional and economical view-point, but it is slightly less efficient. However, as this detriment is more than offset by such essential considerations as simplicity of insulation and design, the latter method of construction will be treated in this article

The primary will consist of eight pounds of No. 10 D. C. C copper magnet wire wound on one of the legs to a depth of four layers. A space of 1/2 inch should be left at both ends of the insulating sleeve so that there will be no dauger of the primary's sparking to the core. Consecutive layers should be paratined and insulated by several layers of the oiled muslin cloth insulated by several sayers of the olied musin citor as the static kick back from the secondary if a large condenser and aerial are being used, is sufficient to cause "skin" currents upward of 1,000 voits to be generated in the primary. In severe cases of this kind the kick back is sometimes strong enough to consparking with subsequent arcing and burn out in the



Fig. 4 .- Secondary partly assembled



Fig. 5 .- The completed transfern

fixtures, thus constituting a serious five hansed to the building in which the viruless plant is located. To alleviate the strain, a low-capacity, selectorype col-dancer constructed of glass plates, should be shunted across the supply mains and the constru conductory grounded to relieve any abnormal difference of possetial between the two supply lines or

STORES AND REAL PROPERTY.

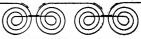


Fig. 6.-Diagram of the s

nd the ground. This connection is given in Fig. 2. The primary may be taped for appearance and m hanical protection.

The winding of the secondary pres

most difficult and trying features in the construction of the whole transformer. Several miles of fine who

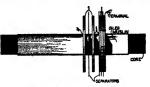
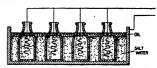


Fig. 7.—Method of assembling the secon

must be recled into thin pancake-like sections-a task somewhat allayed by the proper winding machinery—a lathe preferably.

The square hole in the center of the section should be sufficiently large to allow it to fit snugly over the



Sectional view of the liquid of

core and insulation, about 2% inches by 2% inch When a lathe is not available, a simple winder may be constructed similar to the one in Fig. 3. This consists of a fan motor with the section winder botted to the end of the shaft. The winder or form comprises two disks of \( \xi\), such majle seven inches in dismeter upon the face of one of which are fastened four iron pegs spaced 21/4 inches apart. The wire is wound on over e pegs between the walls of the disks until a sec tion is formed 6 inches in diameter. Twenty sections should be wound in this manner. The size of the wire is No. 82 D. C. C. Nine pounds will be needed.

The sections upon being wound should be removed to

a pan of melted parafin and beeswax for impregnation. The temperature of this compound should never exceed 100 deg. Cent. or it will carbonize and lose its in The coils should remain in the insulating mixture for at least 15 minutes or until all air bubble cease rising. They should then be pressed until cold between marble slabs and taped with strips of bias between marties makes and taped with strips to one cut chied muslin cloth, ½ inch wide, particular care being observed that the wires do not become kinked and that their direction is definitely marked when they are taped.

As mentioned previously, there will be 20 section As mentioned previously, there will be an sections in all. As the secondary, output in volts is about 20,000 a potential difference of 1,000 volts will exist between consecutive sections. Circular, olied muslin cloth sep-arators 6½ loches in diameter should be piaced between the sections as shown in Figs. 7 and 8 to rethe strain between them.

There are several well known methods employe ting the secondary coils. The one, treated herewith, possesses the advantages of a higher efficiency than the others, and the strain between consecutive sec-tions is much less. Both end sections will terminate with an outside turn so that two of the choicest should

with an outside turn so that two of the choicest should be set saide for this purpose.

The core leg should be clamped in a vise and a sec-tion slipped on to within two inches of the lower end of the insulating sleers. A separator should then be placed against the section and the inside turn tongst under it. Observing the direction that this turn takes, another section should be lowered into position in such a manner that its inside turn rens in the opposite direc-

(Concluded on page 452.)

The American Control of the Section of the Section

### MENTS PATENTED INVENTIONS

These columns are open to all patentons. The official are inserted by special arrangement in the inventors. Terms on application to the dverticing Department of the Sciencistic

#### Pertaining to Apparel.

Estrabathing to Apparent, (ARMENIP-C. R. Divinan and J. W. Barcelmans, J. W. Barcelm

covering the same.

EIMBL BEARDT BUFFER.—H. G. BENDIX,
977 A Potam Ave. Breoklyn, N. Y. Among
the objects of the invention is to improve help
breast buffers so that the buffins operation may
now the same of the control of the control
breast buffers of that the buffins operation may
now that has heretofore been possible and also
whereby the danger of damaging the texture or
flash fash meterial of which the main
portion of the shoe or slipper is constructed
may be obtricted.

#### Electrical Bevices,

may be obviated.

ELECTRODE SUPPORTING ROD FOR
ELECTRODES OF PROPERTING ROD FOR
ELECTRODES OF TANKES—P. JRANSK, care
of Leo Goldberger, 146 Smith St., Parth Anboy, N. J. The object here is to no construct
of the Goldberger, 146 Smith St., Parth Anboy, N. J. The object here is to no construct
on the construct of the construction of the object object of the obje

BLECTRIC LIPCK STRIKE.—F. F. SCHNSIDER, R. F. D. No. 48, Ridgefield, Conn. In this case the invention relates to electric lock strikes, and more particularly to keep-



ELECTRIC LOCK STRIKE.

ers or atrike plates for door latches, whereby the latch-engaging portion or element of the keeper can be electrically released from a re-mote point whereby the door is unlocked and allowed to swing open.

### Of interest to Farmers.

Of laterest to Farmers.

LAND ROLLER.—M. Antesano, care of G.
A. Eberly, Atty.-at-Law, Stanton, Neb The
machine is farwar along the ground by horse
or other appropriate means and disks of careries by rolling upon the genomic cause ridges
to be formed between them. Teeth of the disks
of another series puncture these ridges of provide them with holes to receive meisture absorbed by the ground. The form thus given
of earth from heing shewn or washed aways.

of earth from heing shewn or washed aways.

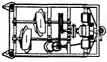
of the soil also prevents the lighter particles; provious means on the soil also prevents the lighter particles; provious means are considered as a very long MILLERING APPARATUS—A. F. Branning.

H. E. D. N. O., Canisten, N. Y. This apparatus is arranged to milk simultaneously a large mulmer of cowes in sets of four, to alsew III of the second of the

Miles Chief Con

MOTOR FLOW.—J. N. PARESS, Bedford City, Vs. In this play the traction whosls may be coupled to the driving mechanism at will. The power is transmitted equality to all of the traction whosls through a centrally-dis-posed drive. The shanks carrying the tools are disposed to that the turrows offset to one side of the machine.

MOTOR HARBOW.—T. Camp, 87 Norcross
St., Atlanta, Gs. Mr. Camp's invention is at
improvement in motor harrows, and his pur
pose is the provision of a device of the char



acter specified which will thoroughly cut up and pulverise the soil and which will propol itself through the fold by the operation of cut-ting the soil. The accompanying litustration shows a pian view of the improvement.

### Of General Interest,

OF General Interest,
DEVICE FOR MAKING DESIGNR.—L. L.
ALGAN. BOR 701, Atlanta, Ga This device
has a bar carrying a marking member, the ber
being operated by a rotatable member to which
it is articulated, the marking member being
adapted to produce a design on a table which
have with the marking member is operated.
MATRIX DEVICE.—J. A. MAKER, 317 Terry
Bidg., Dulutk Minn This invention relates
to markit davices for nue in dendatry, and
has reference more particularly to a dovice of
this class which comprises a body, a markit
ing the markit, and mema rot holding the
matrix in different adjusted positions.

matrix in discrent adjusted positions.

SANITARY SHAVING MUG—J. B. RUDOLPH, 878 Ocean Ave. Jersey City, N. J. The
Revention has reference to an improved form



SANITARY SHAVING MUG

of shaving mug, and an object is to provide a mug so shaped and constructed that water and injurious acide in the soop will readily drain off the soap into a separate water received. The bandle in this device is no con-structed and positioned that it cannot readily BARY WALEKIP.—B. S. KINCAPTON, 371 Grand Avc. Spokens, Wash. This baby wells-er has a body purtion so formed as to afrod proper abdominal and waiet support for the child; and a convenient seat portion is pro-vided in consection with the body part, as well as the promote the content of the child; and a convenient seat read, no formed a convenient seat read, no formed as the child are promoted the content of the child.

MEANS FOR CARRYING LIFE LINES.

MEANS FOR CARRYING LIFE LINES.

R. F. McCazax, S. John St., Jamales, N. Y.,

N. Y. The investor's sin its to provide a
means for carrying life lises from show to
other attractive and arranged to prevent the
projectic carrying the life in from tumbing
over during its fight and to cause the project
tia to travel a great distance. Mr. McCreary
lines, and the oligect of the improvement is to
provide means for carrying life lines, stranged
St insure a proper uncedling of a very long
life to the control of the control of the control

Mr. McCarry Control of the control of the control

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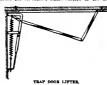
Mr. McC

SHAYING SOAP HOLDER—T. G. Mosoak, care Morgan Salse Co., Shamokin, Pa The invastion provides a device which will take the place of the ordinary shaving stick soap, by providing a bandle for the soap, they making a more satisfactory device for distributing the applied to the soap or remove therefrom the soap or the so

ling rimes and carrying adjustedly interquile arms interquile arms. The property of the proper

equilibrium.

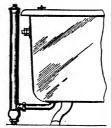
TRAP DOOR LIFTRIt — F. TROYRS, care of C R. Hichey, Route 4, Nampa, Idaho. A purpose here is to provide an operating means for horizontal gates or doors, such as trapdoors for elevators, dumit waiters or the like,



which will render the operation of the door exceedingly easy and which will serve to prac-tically connerbalance the weight of the door throughout its entire path of movement, the effectiveness of the motive means varying subatantially in accordance with the variation in the effective weight of the door during its

awingine operation.

WARTE AND OVERFLOW FIXTURE—W
CAPTLON, Paris, Ill. The lavention provides
a water and overflow fitture having an upper
member of a lower bell water trap connected
with the lower member of an upper bell overflow trap, and a stem for raising the apper
number of the bell overflow trap, the stem
bellar disposed through an opening in the lower's member of the overflow trap, and having
er's member of the overflow trap, and having



WASTL AND OVERFLOW FIXTURE.

a figure disposed below and normally spaced from the lower member of the overflow trap to raise the lower member of the overflow trap and the upper member of the water trap to which it is connected. The overflow trap open as the upper member of the stan the water trap open.

FENIOLDER OR PENCIL RRACE—C. A. REAUGO, CRARA, Coan. The invention refers to stationery and has particular reference to measure for upper and the stan the measure for the connection with penholders, measure for upper the connection of the c

othiry by children beginning to learn to write SPECIFIC CHATTLY BALANCK—B R JOLLY, 138 Fayetterille St., Raleigh, N. C. An eblesh tens is to provide a device in which certain balancing processes are carried out by pushes of, a thumberore which operates a disa so that; when a balance is obtained the pointer and the "disa visit in the pointer of the pointer of the "disa" of the pointer and the "disa" visit indicate directly the florescent of gold or sliver without further calculation.

present patent the improvement has reference to buckles, and particularly to bett luckles, and the invention has for its object the provi-sion of an improved structure in which a sild ling case action to utilized for clamping the buckle in place

hardie in place

DISPLAY RACK—S. RUSSCTTI, R. F. D.

No. 4, Memphis, Tenn. The invention has refcreace more particularly to displays racks for
boxes containing meritanulue, which merchan
disc can be exactly dispensed when desired from
the box without reasoning the same from the
rack structure. This is obtained by providing
a design rack comprising low snapports adapt
of to Prefiprocent in a tack fraction.

ed to reciprocate In a task frame

WERNCH—J. J. Amerikansky, an Politon
K. Monroe, W. The Instead to the towards for effecting a quick adjustment of the
novable jaw, and involving a photoel memics
appurreament to the movelabe jaw within the
shank of the fixed jaw, no useful, conding under
appurreament to the movelabe jaw within the
shank of the fixed jaw, no useful
to the shank of the fixed jaw, no useful
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shank of the fixed jaw, no useful
to the shank of the shank of the
purple AND NUT WHENCH I likest P
HOFMAN, 138 Simmons Av. (Hifton N J,
N Y, N, Y The object of this invention, No,
recently pasted disposal and useful
proveness over other pipe wren in a lo dara
bility, strength and quick action in adjusting
to and releasing from pipes, and in looking the



upper jaw, so as to hold firmly in position when in use on nuts and for employment on side pulls. All sizes of this tool can be oper ated with one hand. All parts of the wrench are constructed of genuine steel.

### Heating and Lighting.

Heating and Lighting.
ILCUMINATED POUTWAIN — If Reserved and Tolk Gountain may be radily moved from place to found in the property of the property of the radily moved of the place of the radily moved with a grade loss, and with the electric light whree in the house, and which will three the ham of light place of the radius of the place of the radius of the radius

the water nozale
LAGHTERE B FISCHER, 231 Grove St.
Brooklin, N. Y. This invention relates to im
provements in lighters or self-ignifing dyters,
and him for an oddect to provide an improved
lighting attractive in which a wick will be
ignited or lighted upon the runoval of the cap

ignited or lighted upon the ramoval of the cap from the device.

\*\*Meuschold Utilities.\*\*

\*\*WINDOW SAMI LOCK—11 KNATE, 833 Van Dazer N., Staphelon S. 1, N. Y. N. Y. The investion provides a look has by a local provided by the hardy and hardy a

nozzio.

DOOR SPRING AND CHECK I B Tarr
Box 525, Ceder Bapida, Iowa. In this patret
Ibo patrag has a shaft, with means for securing the shaft relatively to a door member,
there being a canding mounted for rotating on
the shaft, which is connected with the shaft
by a coiled spring, which rotates the spring
An arm, piveted to the shaft is engaged by
with the half piveting spring and arm, appel mounted
for rotating on a sprind, excurred to a door.
SRADE SUPPRET A 18 Navira, Numice

so take/prese a connect is obtained the pointer for fortung on a spindle, secured to a do a the flesh will indicate discretly the finesses of gold or sliver without further calculation.

BELT BUCKLE.—T. F. Maloner, 2721

Surf Ave, Concy Island, N. X., N. Y. In the support with causing members, each with

porthine disposed at an augic to each other, and each portion having a vertical slot, so that tracket carriers may be conveiled behind the easing members and the intrackets for supporting the shades secured to the bracket arriers may be disposed through one set of vertical shint and a transverse member connecting the bracket members may extend through the property of the property

the bracket carriers. As supporting the bracket carriers. Martin Front, 945 Wiffling Av., Remax, N. Y., N. This invention provides a bolder arranged to form a permanent fature of an irrulus board, to permit of conveniently unviting the bolder into an ortested position for supporting the said allows of moving the holder to be supported to the supporting the said allows of moving the holder total a retracted position to support to the results understand the results and the results are results as the results are resul

not in use "CONVERTIBLE DAVENPORT AND BED -CONVERTIBLE DAVENPORT AND BED -L B Jarrecert, 250 W 15th N; Manbattan,
N, Y, N Y "This led is a ranged to permit
port or a couch to a head or rice verse, without requiring much physical execution, the parts
being securely heid in either position to prevert ac-ridgenial shanking of the same, and to
permit convenient removal of the parts for
cleaning and other purposes.

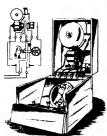
cleaning and other purposes
SUPPLY VAVES - J J MAYER 306 Lenox
Ave, Yonkers, N Y In order to accomplish
the desired result in lith patent use Is under
of a supply pipe having a closed end, e float
lever fulrament on the Cased cod and a vaive
monnited to sittle up and down externally on
the anaphy pipe below the float lever connection, the said valve belog connected with the

WRINGER SUPPORT AND PASTENER .-WRINGER RUPPORT AND FASTERER— WP Blackers, Bostwick, No. The object here is to provide a support adapted to be champed by the ordinary champed of the wringer and invitig means to bluxedly secure one end to a washtin, washing meetine or similar sup-port, to permit the wringer to be swang across the washing serioure, or swint in line with the support, the movement of the wringer to the support, the movement of the wringer to the way or to thright it into a position above a wash botler or other receptacle.

### Machines and Mechanical Devices.

Machines and Mechanical Devices.
FABRIC HOLDER AND EXHIDITOR...F.
A BAABS, curv of G A Elberty, Atty, et Law,
Stanton Neb. The livestion provides a device
especialty adapted for holding a plurality of
rolls of fabric as for instance alias, clotha,
rugs, olicloths or lindoum, and for relating
the fairties in rolled condition or for permitting

rage, olicioths or lineicum, and for retatalage the fairle is relied undulino or for permitting them to be displayed without moving the rolls from place to place, and wherein the rolling and unrolling in time mechanically many the relief of the relief of



TIMING APPARATUS FOR SPORTS

for the preparation, and also for the execution or for the content the device automatically measuring off these respective times in suc-cession, and thereby obviating any charge that the official of the events may not be fair or correct in his timing

MEAT CLAMP.—A H MATTHEW, Colville, Wash. In the proceed patent the purpose of the invention is the provision of a novel meat

clamp adapted to be employed in connection with a table, for clamping a piece of meat for the proper holding of the same while being cut or trimmed.

or Primined.

VENDING MACHINE—0. J. Horaning, 236

Width St., Manhathan, N. Y. N. This invention relates to machine for vending and disposing newspapers and other like articles, either of this class with which autiant collection of this class with which autiant collection end be employed, and which can be used singly or in combinations of pinratifies of quite, scale consisting of one of the medicine.

units, such consisting of one of the methines.
ATTOMATIC ANCHORING DEVICE FOR SIGNALINE MINER—I B. Eria, Hotel de CHilon, Piace de la Concorde, Parls, Pranctical in automatic anchoring devices for success in automatic anchoring devices for success in automatic anchoring devices for success in lateral no secretary in the several operations of unite laying and shee the mooth and easy navanding of the moorning scale.

MARINNO SIGNAL—RANN F. Comments

ling cable

MARINNO SIGNAL—RAMON F. COMMENO,
RIUDO, Venesuela, An object here is to provide an indicating means, whereby the speciwide an indicating means, whereby the specisanother host is approaching or is positioned,
irrespective of the condition of the weather;
that is, to provide a signaling or danger-indicating device which is actuated below the water line, and is, therefore, not influenced by
forgor or storage weather

forgy or stormy weather
ATTA-(HERDY FOR DEWTAL PILIGORES,
—F, C. LAMERY, 242 E Trement Are, Bronx,
N. N. N. This invention provides as at tachment for dental plurgers and arranged to permit the user to conveniently and quickly place the attachment in position on the plurger wiscover it is desired to use a plugging tool standling at an angle to the axis of the nineers.

plugger.

LOCK FOR HAND BAGS.—J. PARTMANN,
615 E Infeth Rt. New York, N Y. As this
hack is coinstructed it is impossible to open
the bag except by the operation of the trigger
on the handic, which may be covered by the
hand used to earry the bag. For this reson
pictopecker are namble to open the bag and
remove the contents thereof in the namour in
which thieves are in the liabil of working

which there are in the labit of working ROTTLE PILLING AND PILLID MEASUR-INI MACHINN-W F ARIMORA, IOT Han-cock Ave, Jersey (1ty, N. J. An olayeth here lar a filing chamber with talet and outlet ports, and member having the plots, and member having the dilling chamber that when the member having the dilling cham-ter with the member having the dilling cham-tured by the subsequently of the con-tance of the control of the con-companies of the con-companies of the con-companies of the con-tent of the con-trol of the con-of the con-trol of the con-of the con-trol of the con-of the con-of the con-trol of the con-of th

titvely to the spindle, the linet port will be-closed, and the outlet port will be subsequently closed. The could be possible to some through the north possible to some through the possible to be possible to the possible to be possible to the po

MACHINE FOR THE MANUFACTURE OF BUTTONS.—E. GADDON, Marolles, France This invention relates to improvement in ma-chines for the manufacture of buttons turned in coroso, bone and other materials, and per-ticularly to machines or lathes in which the

plate to be worked to make a button is beld sustained during the work against a non-rotary claw located in front of the rotary cut-ting tool.

ting tool.

GRAVITY CONCERTS MIXER—G. W.

MILLA and J. E. Sisreon, Georgetown, Pa.

The intention here is to provide a mechanism
by means of which the sisematis necessary for
the formation of concrete may be intunately
concluded in proper properforms by the mare
act of passing the materials through the device
by gravity.

hy gravity.

HOLDER FOR DISKS AND COLTERS FOR

USE WHEN THEY ARE BEING SHARP

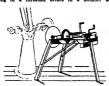
ENERD.—J. J. HUNG and M. E. Weijourt, Weil

Lake, Lowa. This holder has a frame supported by and movable vertically relatively to the

stationary frame, the movable frame having

a bearing at one end, in which a vertical shaft

is journaled, this shaft having a thread meching in a thread ordice in a mounter se-



HOLDER FOR DISKS AND COLTERS.

cured to the stationary frame. The shaft has flanges disposed so that the movable frame may be raised or lowered relatively to the stationary frame of a crank secured to the shaft. Journaled in learnings in the movable frame is a longitudinally extending shaft, to the conter end of which is secured a file or colter to be ground, the longitudinal shaft being driven by gesting while connects a transverse shaft, baving a crank, with the longitudinal shaft being driven by gesting while connects a transverse shaft, baving a crank, with the longitudinal shaft.

longitudinal shaft.

IAANED TRUCK COUNTING APPARATUS.

—I. MCLARRY, Walla Walla, Wash. This is not sharp with the positive in its operation and anapted to be affected only by a truck or similar vehicle when rolled thereover; provides means whereby the counting mechanism with which the apparatus is provided is unaffected by the pass area over said apparatus of the person operation.

COIN CONTROLLED.

the construction.

COIN CONTROLLED DIRECTORY HOLD.

EB —J. A Balowin, 5 West Rt., Maynard,
Mass. The improvement refer to a book hold

or of that type in which the hook is normally

bold closed, but which can be allowed to open

by the pressing of a treadle; and it has pur

teniar reference to a holder for a directory,
with internal mechanism controlled by the in

section of a coll, so that, before the book can

section of a coll, so that, before the book can

only the coll of the coll of the coll of a

satisfable denomination must be deposited.

Prime Movers and Their Accessories.
ROTARY VALVE—M. JASOR. 100 North
Terrace, Mount Vernon, N. Y. An object here
is the previation of an improved valve attrature formed with a head comprising an inner
and an outer vater-cooled momber with a
rotating valve sleeve structure interposed, the
valve sleeve structure controlling the admis
sion and chauselon of greet to and from the
cylinder through the luner momber.

Railways and Their Access

EXTENSION STEP FOR RAILWAY CAUS -EXLEM M. CONDON. BOT 842, Goddfield, Nev Novel means are here provided for operating a movable step which is so associated with the ordinary steps of a railway car that it may be extended or projected below the latter when required for the convenience of passengers en-tering or leaving the car

tering or leaving the car
HAIL THE—L JOHNSON, Marble, Colo An
object here is to provide a tin which forms a
positive hond between the two rails, and which
prevents agreading of the rails. The invention provides a rail the constructed largely of
metal, but which is provided with a cushion
block to absorb the shows from the impact of
the loads coming on the rail

the loads coming on the rail
STATION INDICATOR.—A. McINIIN, Richmond, Prince Edward Island, Canada. In this
patent the object of the invention is to provide
a new and improved indicator or guide for use
on trains and the like for indicating while
the train is moving the name of the next station at which the train is designed to stop.

Pertaining to Recreation.

Pertaining to Recression.

AMUREMENT DEVICE. B. R. PRINT. 449
W. dollar DEVICE. B. R. S. PRINT. 449
W. M. D. R. S. PRINT. 449
W. D. R. S. PRINT. 449
W. M. D. R. S. PRINT. 449
W. D. R

WAGON HOUNDS ... R. F. CLIFTON, Mount Airy, N. C. In the present putent the inven-tion is an improvement in wagen hounds, and

The state of the s

the invasive bas disc his oldest its perceitable of a simple economical and light yet exceedingly strong construction, adjust even to the property of the prop

to support the wheel.

FRONT VERICLE SURPENSION—Ranko
F, Countro, Rubio, Venesseia. This invention
relates to a novel form of wheel suspension,
and more specifically relates to a combined
responsion and shock shownive, particularly
adapted to be positioned on the front of a vebicle or in any other place where the treation wheels are mounted for steering.

Pertaining to Vehicles, VERICLE WITH CELL ULLAR PARTITIONS, BOXES, OR DARWERS WHICH ARE LETT BEDRACKER, OR DARWERS WHICH ARE LETT BEDRACKER, OR DARWERS WHICH ARE LETT BEDRACKER, OR GOODS—C. INDON, station smeter, even for a predestrained space of time, and having regard to the routs the vehicle makes, they may piace in them the goods to be forwarded, wherespec the user limed can shar this own. The consignees, who have been acquainted with the way of opening the secret lock, upon producing the liter libed to safe the goods contained in the bired blot.

box.

IONITER.—G. B. Lambary. 527 Fifth Ave,
Manbattan, N. Y., N. This invention relates to figathers for the lamps of motor vehicles and for other like purposes, and has
reference more particularly to a device which
comprises a vaive for controlling the supply
of farl to the immp, a teel infinite device, and
controlling means for the valve and the lighting means.

DEBIGN FOR A HAMMER HEAD --P. ANDERSON, Freeport, N. Y. in this ornamental design for a hammer bead the implement is a gracefully formed head with claws at the top and claws at the front and near the bottom of the head.

and claws at the front and near the bottom of the inead. DOR A GORIZET—W B. HUTSTER.

DESRIGHTS, W. Ya. This ornamental feelent for a goblet in front cieration shows the body of a drinking vessel of attractive form with its sine resting on a very near force or standard. DESRIGN POR A TOWEL BACK.—A. II. Howe, 375 Thilly Place, New York, N. Y. In this ornamental design for a towel rack front where the two code are bell in partition by a server. Bit places are cut in the band to hold rods for hanging towels.

DESRIGN POR CARPIET OR BUG.—J. O. Pount, care of G. R. Neglice, S. Medison Art. Thompsonville, Conn. Mr. Pegel bias made Nov. 46,181. 46422 and 44,848, each of vox. 46,181. 46422 and 44,848, each of Towlers and tractive heauty.

DESRIGN POR CARPIET OR BUG.—I. O. Podera, finds and centerpleese of highly varied and attractive heauty.

tractive heatty.

DERION FOR CARPET OR RUG—II. A.

Howz, care of G. R. Squire, 25 Madeson Are,
Thompsowile, Cous in this ornamental de-sign for a rug or carpet indowsy between the
calcoratory and gracefully designed border and centerplace is a very open field through which
wind curling storus of small issue.

DERION FOR CARPET OR RUG—W. E.

KATERA, care of U S Squire, 25 Madison Ave,
Thompsourdie, Coun. in this ornamental de-rounds a field and oventreplace of very unique
and pleasing invention.

Norm.—Copies of any of these patents will be furnished by the Scuprusta Ammican for ten cents each. Please state the name of the patentse, title of the invention, and date of this paper.

We wish to call attention to the fact that we are in a position to render compretest services in every branch of patent or trade-mark electrical and chemical experts, thoroughly trained to prepare and presecute all patent applications, irrespective of the emplications, trespective of the emplications, or electrical and explications, irrespective of the complex nature of the subject matter involved, or of the special content of the emplication of the emplication of the emplication of the emplication of the emplitude thereone. On the emplication of the emplica

5613 of a one was well

Stanch Office: 625 F Street, N. W., Washington, D. C.

Sir Gilbert Parker, M. P., the emitten neverbal-statesman, write e from London;

Sangleigen as to my mind a true food toom, feeding the herves, increasing the energy and giving fresh vigor to the overworked body and mind."

Hall Caine, the dramatist, writes: "My experience of Sanat-lius been that as a toute a food it has on more than occasion benefited me,"

the famous Editor, writes
I feel I owe it to truth to start
that i have made a thorough trusl
of Sanstingers and that I have
found it most effections and
beneficent. I do not think I
could have recovered my visuality,
as I have done, without this
handsome operating equally upon
the directive organs and nerve

John Burroughs, the distinguished naturalist and author, writes
"I am sure I have been greatly benefied by Sautangen. My sleep is fifty per cent better than it was one year ago and my mind and strength are much im-proved."

### A New Bookbinding Device

**発展を影響を開発する**など、対象を見れている。

WO big problems that have confront a encreasful solution in the flexing machine of which Charles W. Mears, ad-vertising manager of the Winton Motor Care-Company, Cleveland, is the inventor, patentee and owner

One of these problems is to secure a flat-opening book that does not involve the expense of sewing, and the other is to produce a book of coated paper that is free from the danger of tearing apart be-

When a sewed book is produced, each separate signature of the book must be separately handled on the sewing machine. This involves an expense of time and money that is so considerable as practically to prohibit the production of sewed magazines. In an effort to producflat-opening magazines, some publishers have put into practice a method of trimming off the backs and of applying glue to hold the separate sheets together. This is not an inexpensive process, for the machine that does this work requires an investment outlay of thousands of dollars. two-page sheet must depend upon a mershred of give to hold it in place, there is danger of pages falling out. This danger shred or give to noid it in place, there is danger of pages falling out. This danger increases with the age of the look, for give is an animal matter and rapidly de-

In the case of the book made of coated In the case of the book made of coated paper, even the expensive sewed method is not satisfactory. The reader's eyes fall upon unsightly needle holes and thread in the center of each section, and, if the book is handled considerably, only a short time elapses until the sections tend to separate from each other. The pracimpossibility of holding sections firmly together is due to the coating of the paper, which the glue readily The book then ceases to be a taches.

cempact unit.
These defects of book-making cau the production of the Mears flexer. This machine is designed to work in unison with folding machines and with presses deliver folded signatures, thu avoid the expense of intermediate handling of paper and loss of time. Timed in synchronism with the folder or the press, as the case may be, the flexer receiv folded signature and carries it through the open jaws of a pair of grippers until the closed back of the signature meets an adjustable stop.

The grippers then close on the signature and carry it down over a series of rollers, which bend the signature on a distinct line parallel with the closed The return movement of the grlp pers carries the signature once more over the rollers, bending the signature again in the same place, but in the opposite direction. The grippers then open and the flat signature is discharged into

At the point in the signature where th forward and backward bend is made by carrying the signature over the rollers, the signature sustains a permanent flex. Signatures are enthered in the usual man ner and are then made tato a permanen book by the cheanest and most substan sook by the createst and most substan-tial method, that of side wire stitching. In the reader's hands a book made on this method lies open flat, the pages falling readily to right or left, as the read

The inventor claims for his flaxer an The inventor claims for his flexer an entirely new result in book making—a flat-opening, permanently bound book that can be produced more cheaply than by any other process. On a recent run of 40,000 catalogs of four signatures each, the saving in manufacturing cost by this method as against that of sewing was

Various disse of signatures can be and sometimes sand paper and fine emery madeled on a single fitter, and it is possible to vary the distance of the bend This, of course, requires skillful handling. from the closed best of the signature to It is believed that some means may be destit the job. The adjustable stop is required to the signature of the signature of

### Progress in Landing Zeppelins

M ORE significance than to the loss of the "T. T" the "L. I." under conditions fatal to any aircraft should be attached to recent escapes of Zeppelins from their worst enemy—the danger of being smashed in stormy landings. The military "Z. IV.," returning from the army maneuvers, was evented by a storm from entering the ed at Leipzig. Toru from the hands of soldiers by a gust, it was violently raised. Two soldiers were killed, but nothing haped to the airship, which, fully manne with motors running, was instantly und

control in the air. The writer was privileged to see an in-teresting docking of the passenger ship "Viktoria Luise" with the Grand Duke of hessen and two princes of Greece aboard in a gusty wind blowing across the en-trance of the shed.

Extreme caution was observed and the latest developments in the art of land ing were shown. The ship, held by not more than twenty to thirty men, was bumored like a restive horse. The men on the ground held it on four bundi ropes, fore and aft, and by railings, fast ened to the sides of each car. Four heavy ropes with clamps to hitch to trucks on the docking tracks, were also manned for instant use. Gusts would alternately raise a car, forcing the men to let go. Running. they caught it again like an enormou football.

Those at the ropes simply slackened with the gusts. Two officers on the ground gave brief commands. The wind shift so suddenly that the men at the float ing rear end had to run, keeping pace with the swinging hull. But even the front car, resting and pivoting on its inflated huffer-bug, was occasionally dragged over the turf. After a heavy gust the rour of the rear motors would be added to the incessant humming of the forward one, and two of the propellers begin revolving. Captain, officers and engineers were at

Later (the serial sparring had lasted beyond noon) the steward was seen emerging from the passageway above the front car with some lunch. The ship was first worked toward the shed. tempt at entering proving too risky, it was taken back to the distant moorings, not to be anchored to the strong chain fastened to a buge "cannon ball" heavy socket, nor to four buried blocks by radiating cables, but to reach a water sup-

While it still bobbed in the gu long flexible hose was run into the 'hold' and the equivalent in water ballast of the passeligers' weight was pumped ab A rope-lined gangway was lowered, and during a quiet minute the passengers were safely landed, followed by the captain

Relieved of his worst responsibility, he turned the bridge over to the first officer. During a longer lull the ship was late quickly run into the shed with the help

of the propellers. "Z. I.," returning fro The military Silesia, was met by thunderstorms. Con trary to former methods, it sought refuge in the air, weathering heavy winds for eleven hours. Fleeing toward the north it cruised for two hours above Posen, pur sued by a chain of thunderstorms that extended to the Baltic. After the storm had subsided in Silesia it pushed through and returned safely to its starting point.

### Removing the "Shine" From Woolen Garments

W COLEN garments, especially hard finished ones such as serges, soon be-come shiny from wear and the problem ove the shine. Some tailors in doing this use a wire brush which oper-ates to pick up a surface resembling nap Various since of signatures can be and sometimes sand paper and fine emery



When you take Sanatogen you join hands with many of the world's most distinguished people, people who paid in tired and disordered nerves the penalty of success.

A vast company of Statesmen, Churchmen, Authors, Business Magnates, Social Leaders, etc., who took Sanatogen often on the advice of their physicians, have written of the gratifying results which followed. They tell us how, in times of mental or nervous exhaustun, Sanatogen instilled fresh vigor, rekundled energy and ambition, and made life and work once more a pleasure; how, when digestion was upset, sleep uncertain, Sanatogen sharpened the appetite, gratefully assisted assimilation, and promoted restful slumber.

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effects.

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### The Industrial Need of Technically Trained Men-VIII The Possibilities of Railroad Engineering

By A. W. Johnston

[Mr. A. W. Johnston, the author of the following article, began his reliroad caree early forty years upo. Educated as an engineer, he was enyaged in engineering wor (Mr. A. W. Johnston, the author of the following arms, very conserving work mearly forly years ago. Reducated as an englewer, he was empaged in engineering work about Afteen years, and for the remainder of the time has been an operative and administrative effect. From 1889 to date he has been Division Superintendent, General Engerintendent, and General Manager of the New York, Chicago and St. Louis and St Railroad. Mr. Johnston is a charter member and past president of the America nusrous... ar. vonasion se e carrer mismor any puts pressons of the American Robert way Engineering Association, and a member of the American Society of Civil Engi-neers. He is a graduate of Massachusette Institute of Technology.—Entros.)

wanderer over the face of the earth. His training was largely in the school of experience. On his ability as a locator of prince, or his ability as a locator of railways depended very largely the office of the most flavorable preliminary theory of the most distinguished men in the general profession of engineering came thus promisence by their ability in locating and construction, but might be profession of engineering came thus promise in the results and, perhaps brilliancy, an exercise position on maintenance. Fructing rallways.

Some rallways of the earlier type, once

constructed and in operation got compara-tively scant attention from an cogineerling staff. Very often records of surveys ly. The first eight or ten years of and land plans, and all such data, the career must be regarded largely as ing staff. preservation of which to-day is regarded as imperative, were either not properly compiled, or entirely neglected. In my earlier experience in the engineering department of a prominent railway, I was charged with the duty of a complete reof a liue which had been newly scyulred, and in the archives of which not a scrap of paper covoring surveys or roffles or rights of way could be found in the progress of rallway development,

there has been a gradual evolution. To day, it may be said there are two general classifications of railroad engineers; engineers of construction and engineers of maintenance. In some instances the ongineers of construction are still wanderers over the face of the earth. They are the explorers; they carry the banner of civilizatleu into remote corners, and upon their judgment and skill as engineers, as well as upon their executive capacity as ministrators, hinges largely the future efficlency of the routes they open to com merce. In other cases engineers of con struction are staff officers of large systems of railways, engaged in directing the opening of branch lines or the improvement of existing lines, or in other insta юч, directlng new "Construction" spart from what known as "Maintenance

Engineers of maintenance are usually charged with the duty of conserving the property, which involves a knowledge of track maintenance, and of bridges and structures of all kinds, water service, drainage, signals, and interlocking, and of the multifarious details entering into such subdivision of the work

The young man contemplating entering the broad field of engineering as a life's and a determination to pursue with fixed purpose, some one of the several paths along which his predecessors have built ne the landmarks of engineering progress

In dealing abstractly with the two general subdivisions indicated, construction eering and mainten it should be understood that they rest upon the same foundation, or start from the same roots, and the difference in practice is largely a matter of convenier ninistratiou

The engineer of construction on orig railroad location, does have a differ ent view from the man who follows him later as a maintenance engineer, in that he creates the property, and the latter conserves it. Both men have started with same initial equipment as to technical training, and should have the same incentives; loyalty to the profession, desire for advancement and carnestness of purpose The diversion of paths is very often a matter of opportunity, to be retraced or pursued as the personal talent of the young engineer fits into the solution of the problem ahead. How often it has been

A RAILROAD engineer, as commonly said out "at the front" in discussing community and authorstood, in the earlier listory of particular construction, was primarily the man who spied out the land and determined the location of the line. He was a misued the location of the line. He was a material spittude for judging distance, wanderer over the face of the earth. His result of the spied of the spied of the spied of the spied of the spiedure of t

cracting position on maintenance.

The young man, entering upon the career of a railroad engineer, will ordinarily conclude, after a year or two, that the procession up ahead moves quite slow-ly. The first eight or ten years of his preparatory; he is putting some of his technical knowledge into play more or less of the time, and eventually he learns to differentiate between the application of "pure science" to his everyday problem and the application of principles based on the experience of the profession.

Italirond engineering as practised to-day, calls for the highest form of intelligent interpretation of the scientific meth ed as applied to the most practical of

every day problem ere has been thrust upon the railroad eugineers in recent years a grave respon sibility for the safe operation of railways. The public, through legislative action, has demanded almost revolutionary practice demanded aimost revolutionary practices along certain lines Rail manufacture, sigual installation, electrical operation are all special problems, calling for the highest type of technical knowledge. Specialization along such lines is inevitable and the young engineer has a constantly widening field from which to choose.

The railroad engineer is not nece limited in his advancement in railroad service, to progress along strictly engi-neering lines. On many roads the opportunity to take up the so-called transpor-tation problems is not denied him, and many of the railroad officers of important railways were trained as engineers, and as time goes on, there will undoubtedly be an increasing tendency to give such men an equal chance with the man whose men an equaticisatic wint too man works sole training has been along so-called practical lines, but the young engineer who would supire to advancement in transportation work, must not (as was concisely put by a railroad president now self an engineer) remain s work, should have a predilection for the mathematical and mechanical sciences a poor administrative officer. This last a poor administrative officer. This last suggestion emphasizes the need of differ-entiation in the mind of the young engientiation in the mind of the young engi-neer, between the value to him of exact thinking which comes from the study of the engineering sciences, and the ordinary training received outside of the engineerols. Pure mathematics n assist him in systematizing the admi trative features of a large construction corps, but it does aid in prompt and same determination of many of the every-day so-called purely practical problems.

Not all the able engineers were trained in technical schools, but they had to ac-quire and apply the principles of engiquire and apply the principles of each neering science by observation and by con-tact along the slow and oft-times tortuous road we call "experience," so the young man who chooses the field of failroad en-gineering for his life's work, must get his foundation of the sciences som ms rouncetton or the sciences somehow or somewhere, and then pertently and pernistently build up his store house of expertence. There are many paths in the field before him; opportunity lies slong them all. Let him he ready to seeins \$1.

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The Construction of a One-kilo watt Closed Core Wireless Transformer

(Concluded from page 258.)

tion to that of the first coil. The wire should be then scraped clean with a sharp knife and the connection made, soldered and taped. Another separator and sec-tion should be placed on the leg and the pected to the outside turn of that one In this manner the twenty secondary units should be assembled, particular care being should be assembled, particular care being observed that the turns of each section run in the opposite direction to those of the one preceding it. (See Fig. 6.) The transformer will produce no spark whatsoever if a mistake is made in the connection. Heated parafin should be poure over the completed secondary until all the spaces between sections are completely filled. This materially increases its elec-

The end pieces of the core between primary and secondary may be next inserted and the completed transformer will appear as in Fig. 5. It may be mounted in a case or immersed in boiled linseed of at the option of the builder. If it is oil immersed (in a metal tank) a space of two inches should be left between the windings and the metal sides. With the suitable condensers and average condi-tions this transformer will transmit sig-nals a distance of 100 miles overland and, at night and over salt water; 200 or n per cent farther.

As the condenser is, next to the trans-former, the most important feature of the transmitter and, in the same relation the most difficult to construct, a few words

here concerning it will not be amiss.

There are two distinct types of condenser in use nowadays in wireless tele-graph transmission; the leyden jar and the glass plate type. Each has its advan-tages. The latter is more compact and corona loss is extremely low. The former, if electroplated, within and without, is ju as efficient and a puncture is m located. The leyden jar coated with tin foil is about the poorest though most frequent selection of amateurs for a condens Tin foil blisters and deteriorates under the action of corona or "brush," breakdown is common and the construction is tedious.

The most effective condenser for an teur use and one that has been adopted in a modified form extensively commer-cially, is the homitest. It has but one disadvantage—bulk. It is practically im-mune from breakdown and corona is entrely eliminated. It is constructed of milk or beer bottles, certainly an appeal to the purse. For the transformer described herein a condenser as construct scribed herein a condenser as construc-ed after the specifications given below will be found much more efficient than one of the glass plate type and breakdown or puncture liability is extremely low. The cost will not exceed one dollar.

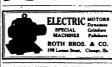
In a metal tub place sixteen quart milk or beer bottles and at a corresponding level fill them and the tub to within three inches of their tops with a saturated solution of sait and water Make the connec tion in the bottles by a colled copper wire and lead them all to a central conductor. The metal tub will constitute the connecnaturally, adapts itself to the irregulari-ties of the glass surface, hence no air bubbles to invite breakdown will form, pubbles to invite breakdown will form, and the surface dissipation leakage can be entirely eliminated by pouring on boiled linseed oil until a layer 1/4 inch deep is formed over the water.

In conjunction with the 1 kilowatt transformer and condensers, to comply with the new "Wireless Law," a helix of the loss-coupled type must be employed to insure the radiation of a wave free from unnecessary damping. This may to insure the radiation of a wave free from unnecessary damping. This may consist of a wooden frame, say 14 inches in diameter and 10 inches high, wound with heavy copper wire, as in the case of the old-style bulk, but in which a small-er, consentric coil of a fixed number of wints of finer wire, is made to side and four wary the coupling. A relating say



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### Ocean-going Submarines (Concluded from page 284.) tion of their numbers; and in a general

world. In the mere fact of this reticent is to be found convincing evidence great importance which is attached to tid ranch of warfare. Decided and helittled in the early days

of its struggle for recognition, the subme rine at last has come into its own. The principal objections against this type during the early years of experimental work were its lack of speed, its limited steaming power and its restricted radius of action. So great were these limitation that it was considered to be useful merely bor defenses in the way of long range guns, mortars and submarine mines. That the charge was well founded is proved in we call to mind the limited dimension and power of our submarings at the com mencement of the present decade. The bonts of the "Adder" class, of the year 1902, were only 63 feet 4 inches in length of 120 tons displacement, and of seven to eight knots speed. They carried but one torpedo tube and a very limited supply of gasoline. Four years later the submarine of our navy were still very small craft their length being 80 feet 6 inches, then displacement 170 tons, and the speed 10 uspacement 170 tons, and the speed IC knots on the surface and 8½ submerged. To this class belong the "Curtletish," "Viper" and "Tarantula" of 1906

Between that date and 1009, when the

boats of the "Stingray" class were launched, there was a marked develop ment, the displacement increasing to 274 ment, the displacement increasing to 27stons, and the horse-power for surface pro-pulsion to 500, as against a surface horse power of 100 in the "Adder" of 1892. The armament was doubled, these vessels carrying two torpedo tub

it was now realized that the submarius was so far developed in efficiency that the time had come to enlarge its size the time and come control of the habitability, crubbing radius, sufficiently to enable il to become sea-going, al least to a limited extent. Hence, we find that the loats, of 1911 have an overal length of 148 feet, a displacement of 520 tous, that they can develop 950 horse power when steaming at the surface, at nower when steaming at the surface, at a maximum speed of 14.5 knots, said that in the submerged condition they have a speed of 10.5 knots. Furthermore, they can travel on the surface for 2,500 miles at a speed of 11 knots, which means that at a slower speed than this and with a full supply of fuel in their tunks at startiug, they are capable of steaming acros the Atlantic Ocean.

We present an illustration of one of the latest submarines, completed for our nay, in the Fore River yards, Quincy, Mas She is one of what is known as the K class of eight boats. Her dimensions are Length, 148 feet; diameter, 15 feet. He radius of action at the surface is 2.500 radius of action at the surface is 2,000 miles at 11 knots, and she can travel 120 miles submerged at a speed of five knots. Our latest designs carry four torpedo tubes and have a cruising radius of 4,500 miles.

That the submarine will ultimately in

ase in size, habitability and speed unti it is perfectly well able to accompany the it is perfectly well able to accompany the battleship at any desired speed on the high seas, is abown by the dimensions which have been cabled from abroad regarding the intest Buttish submarine, which is knots and a surface speed of 35 knots and a surface speed of 36 knots among the various lines along which have always and the surface of the surface of the surface Among the various lines along which have interest is being registly developed, we know of none that presents such pos-sibilities or is full of greeter promise than this of submarine warfare.

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to correspondents are printed from time to time and will be maled on request.

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do not know any experimental evidence that if cast (12982). C. S. acker: Kindly settle those detacted case: A party contends that the blue flatter of a gas cooking appearate heates better than a red flatten. I contend a red flatten its greater heating power than the blue flatten. I contend the red flatten its greater heating power than the blue flatten. I contend the red flatten is separate heating power than the blue flatten of the oxygen to produce buildness; and add in producing more calorie, bence renace heating capacity of the gas jots. This is an inectical power of the producing the producin man in a fundation fame the light is given our from host solid particles of carbon. Hold a piece of white paper down over such a flavor and removal to quickly. It is amounted by the soul of the fame which the cool paper chilled. This increasured evelow, the soci, is in the flame which the cool paper child. This increasured evelow, the social is in the flame below. The construction is to construct the flame the oxygen is mixed with the gas before it reaches the flame, so that the combustion is rapid and complete. The full amount of heat is resulted at once, and only colorius game come away from the flame of you remone get any soot from a complete blue flamenty of the soul so the control of the soul of the

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### The Chronology of Aviation

THE Scientific American has received from Mr. Hudson Maxim and Mr. William J. Hammer, a limited number of the repunts which they have just issued of the very complete "Chronology of Aviation," originally prepared by these gentlemen for the World Almana of 1911. The data embrace the essential facts relating to serial progress. In addition to a short historical refundit, one finds herein tables giving allitude records, speed records, queck stating and slow-speed records, pastenger carrying. English Channel and other over-water flights, cross-country flights, notable distance and duration flights, etc. There are also statistics relating to accidents and data relative to spherical and drugble balloons or arrishing, etc. Of no small interest are the tables giving the most important flights of the Wright brothers. There are doubtless many readers of the Scientific American who are much interested in this subject and two would be glad to secure a copy of this interesting brocknire. They can do so by applying to the Aeronautic Editor of the SCIENTIFIC AMERICAN, 361 BROADWAY, NEW YORK SCIENTIFIC AMERICAN, 361 BROADWAY, NEW YORK

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### The Ruler of a Kingdom

The man who sits at the steering wheel of his New Chalmers "Six," rules an empire. Here within reach of his arm is a little world all his own. Power, speed, endurance—the forces that make for change and enjoyment—are under the sway of his scepter.

At the touch of his finger the might of sixty horses—eager but restrained—stands ready to do his bidding.

### Let's Take a Day Off

Don't you feel like cutting the traces, and getting away to the hills? Let's strike out—what do you say?

strike out—what do you say?

Push the switch of the electric starter. There—the engine is running with scarcely a sound. Now the starter has reversed and is recharging the batteries ready for the next time. The silent Entz system does all this automatically. You don't have to give it a thought.

### Floating Away Like a Swan

Close your eyes now as we let in the Close you can tell when we start. This new clutch is a wonder. Its steel discs with their many fingers of cork, grip so firmly, yet so gently, that we move away with the silent grace of the swan.

We're off. Notice how flexible the power—mounting quickly to 20—30—40 or even 50 miles an hour. Now we throttle it down to two, without shifting gears—then away again swift and silent as the eagle's flight.

This wondrous flexibility is in the motor itself. There's no need to resort to cumbersome double gearing.

### The Mystery of its Silence

Listen as we speed her up a bit. You hear nothing but the rush of the wind. We have discarded the noisy little wedge-like cams still generally used. Our big, oval cams lift the valves and

slide them shut with velvety smoothness. So here we are spinning along at fifty miles an hour as quietly as at fifteen. This silence tells you that there is no friction, no wear; that year after year this car will keep on running as quietly and smoothly as it runs today. When you can have such a car, why be content with any other?

### An Immense Saving for You

Let's take a look at the motor. A beauty, isn't it? Not a moving past in sight.

The valves are made of Tungsten steel so hard you can cut glass with it. The terrific heat of the cylinders never injures them.

So they never leak nor waste power.

They rarely need regrinding.
Tungsten steel valves cost us \$80,000
extra per year but they mean an enormous saving to you.

### Easy Chair Comfort

Have you noticed that in this car you don't feel the vibration you do in most cars? It runs with a smoothness impossible in any four-cylinder car and very rare among sixes.

Vibration is the chief enemy of durability. The absence of it nearly doubles the life of a car. It doubles the comfort too. You can ride all day long in the New "Six." with the comfort of your easy chair.

### A Little Friend in Need

Watch now as I cut down the power until we barely creep along. I am not giving the motor enough gas for the work it is doing. Any motor would ordinarily stall with so little gas. But now I push out the clutch to change gears.

At once, this wonderful motor picks up. The Chalmers-Entz Electric starter does it. It keeps the motor running—won't let it stop. Think what that means in crowded traffic.

### Mounting Like Eagles

Now up we go—taking the long mountain grades as easily and quietly as the level stretches. The absence of effort is amazing.

### Chalmers Motor Company. Detroit. Mich.

The power of this master motor seems limitless. Its valves are bigger and open wider than common; they can't obstruct the flow of the gases. All six cylinders draw gas equally from a triple-heated reservoir. So even with low grades of gasoline, every atom is turned into power. Think of the saving in a season's fuel bills.

### On Top of the World

Two hours away and here's a new world spread at your feet. Let us take a look at the car that made it possible.

Look at the graceful lines of the bell-shaped body—roomy and comfortable. See the graceful, molded oval fenders.

Tires are carried in the rear, leaving the running board clear. Gas tank in the rear too. It holds 22 gallons.

Of course, you've noticed that the driver sits on the left. Control levers are in the center, leaving plenty of room to enter from either side.

### A Home Run

Luncheon over—and we're off again for home. See how gently our big brakes ease us down the steep grades; how our long underslung springs and drep upholstery cradle us over the bumps. See the landscape flying backward like a scudding cloud.

Surely in all the world there's no car like this. It gives a luxury of motion you've never dreamed of; a world of enjoyment in motoring you have never known.

### Put This Car To the Test

Go ride in the New "Six." Let our dealer take you out on our Standard Road Test. It is our way of proving to you that this car will do things that no other car will do.

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# SCIENTIFICAMERICAN

### THE WEEKLY JOURNAL OF PRACTICAL INFORMATION

YOLUME CIX

### NEW YORK, OCTOBER 18, 1913

PRICE 10 CENTS

### Cutting Down the Pitisburgh "Hump" District

By Harry Chapin Plummer

There is rapidly approaching completion in Pittsburgh what is known as the \$5,000,000 "Homproment. In tess than two years the grades of streets aggregating 2.16 miles in length, forming an area of 33 acres, which had long been known as the "Hump," have been reduced by a maximum cut of 103. feet. The physical undertaking alone, acclusive of the outlay following condemnation proceedings, has cost \$800,000.

The work has been of benedit principally to Fifth Avenue, one of the city's chief arteries of business traffic, and the work has centered about the handsome Allegheny County Court House, one of the

Alleshary County Court House, one of the finest public buildings in the country, the Frick and Carnegle office buildings, both "akyserapera," and the County Jail. Frior to the commencement of cutting operations, Fifth Avenue had a grade of 7½ per cent, which rendered the thoroughfare actually daugerous for raffic, at times when the pavenents were well with rish, or were fee-coated in the winter. Moreover, the narrowness of the street combined with the steep grade to cause an aimost constant congestion.

To effect the useded improvement, it was mecessary to cut away the creet of the "Rium," and by this change the ground floors of the massive buildings fronting upon Firth Avenue became the second floors and the basemonts became the street floors. This necessitated sweeping attentions, not only in the very structure of each of the buildings, but in the catrances and loblies and elevator facilities. The lower portion of the fanded or each of the office buildings has been practically remodeled

As the result of these improvements, the grade has been reduced from 7.5 to 48 per cent. The improvement in the grade and the architectural treatment of the lower portion of the buildings is strikingly shown in the accompaning illustrations.

### If Anta Were as Big as Men

S PENCER in his "frinciples of Hology".

Shas shown that the power of assimilation in animals is dependent on the surface of the digestire duct, and that it varies as the square of the dimensions of the body, whereas the consumption of material is proportional to the cube of the same dimensions, so that the ratio of the two factors decreases at the same rate as the size of the animal lucroses.

the size of the animal increases.

This principle, as pointed out in the Recue Retentifyace by Dr. Ywes Delage, is of the lighest importance it understanding indogeni phenomens and lead-to a number of interesting conclusions only partly enunciated by Spencer.

It has frequently been suggested that the ant is relatively stronger than either man or horse. The insect can earpy on its frail legs a grain of corn ten tinese the weight of its body, whereas man and horse carry leads equivalent only to the weights of the tody, whereas man and horse carry leads equivalent only to the weights of their bodies. The inference that the ant is greatly superior from the point of view of its structure and strength, can be shown to be strongent and strength, can be shown to be strongen and at to grow in all directions to twice its origing dismensions, but will retaining its geometrical and histological structure. Its volume and accordingly the weight of its body will increase eight-fold. The suschess there is no the strength of the strength.

Canal Brokenson - 10

which is only proportional to their cross-section, the ant increased to eight times its weight is only four times as strong as before, that is, carries only forty times its original or five times its present weight; in fact, it is in proportion only half as strong as before. If now the same ant grew in all directions to dimentions, not two but a thousand times their original figure, thus reaching the size of a man or horse, it would be a thousand times weaker than before, being able only to carry 1700, instead of fen times, its own

I believe terms the ratio of the power of assimilation to the consumption of the body its "physiological efficiency," and accordingly emmelates the theorem that this factor decreases at the same rate as the size of the body augments. This theorem applies

The work of cutting through a street, house and store so as to lower the grade of Pittsburgh's Fifth Avenue from 7.5 to 4.8 per cent.



Cut of 14.9 feet, whereby the first floor, occupied by a savings bank, becomes the second and the institution must remove to the new street floor.



Fifth Avenue in the "Hump" district after the completion of cutting away the

to physiology as well as to outogen and phylogeny 1. Physiology. Since pencifically all organs producing substance useful for the organism, as well as those serving to eliminate waste materials, are hollow organs depending for their working capacities on their surface, while the consumption of those substances and the production of waste materials depend on the volume. Speacer's proposition, as medified by Delage, will be resultly understood

2. Ontograp The morphogenous phenomena of oncogeny consist multily of invaduations and protrusions by which the organism with lis complicated forms and internal organs is produced from the round e.g. When the development of the embryo has come to an end, the organism has reached its maximum physiological efficiency, which accounts for the fact that his growth is

then the most rapid. As the growth of the organism continues, the physiological efficiency, however, decreases, and when the productive powers just binaince the consumption of the body, growth comes to an end under normal conditions. The equilibrium thus stended will last for a long time. Any deteloration of the body try disease, etc.), however, reduces the power of usefullation, whereas its cuisumption remains practically unaffered, that is to say, the physiological efficiency of the body decreases, and this continual decrease eventually results in the death of the built should.

3 Phylogeny When considering the evolution of various phylecte pedigrose, a striking parallelism is noted between the physiological efficiency and the outogen-sels of individuals. In fact, each such pedigree commences with samil, slightly differentiated forms, in noder by gradual evolution at hash to arrive at highly differentiated forms of considerable dimensions, which eventually vanish, time extinguishing the whole pedigree. Since the physiological efficiency of large sized animals is very low, the utilimate extinction of these speckes will be resultly known.

Houbitiess there are other factors as well at play in connection with these phmomena, but the "physhological efficience" of Individuals and species may certainly claim a paramount position as a determining factor.

#### Fine Specimen of Mammoth Found in Siberia

THE Natural History Museum of Paris Theorems of the specimen of man moth with the flosh paris preserved to a certain extent. The specimen was offered to the museum by the Count of Slenhock-Fermor who found it in one of the Islands of the Siberdan region. After extracting it at his own expense be brought it to Europe by sled, boat and rullroad. This be probably the only specimen of the kind which central Europe Is to possess, for the Russian government has besued a takes probably the only specimen of the kind which central Europe Is to possess, for the Russian government has besued a takes probably the only specimen of the kind with the or in part. Such animals preserved in the lee have been known state 1806, but the only specimen preserved under these conditions up to the present and brought to Europe Is to be found at the museum of the Academy of Sciences at St. Petershare.

Lately, the Russian selectists have been engaged in studying the flexiby parts from the standpoint of anatomy, histology and the Bike, and these researches are expected to gledd some valuable data. As to the Parks specimen, it is well enough preserved to allow of carrying on similar researches, and these are already in propagation of the property of the meaning the property of the property of the meaning of the mea

### SCIENTIFIC AMERICAN

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e und Oardens

The Kiltor is always glad to receive for examination flustrated articles on subjects of tone) independent little photographs are smortly, the articles short, and the facts articles the contributions will receive special attention. Accepted articles will be paid for at regular space rates. The purpose of this journal is to record accurately,

simply, and interestingly, the world's progress in scientific knowledge and industrial achievement.

#### A Dangerous Bill

a matter of international courte A right for Representative Kalm of California to introduce in the House a bilt which will enable withblors at the Panamu-Pacille Exposition to import free of duty articles and building materials intended for the Exposition But does international courtesy denound that the Librarian of Congress and the Conper of Putents he required to record "any certificate of registration, convright, trade mark, or natent the foreign exhibits at the Exposition?

Clearly, the management of the control o

Clearty, the purpose of the mensure is not only to permit foreigners to escape our duties, but also lo prevent the citizens of this country from manufactur-ing, using and selling imported articles of merchandise not patented in this country, but exhibited at the Ex-position. As the bill is now phrased, it matters not not provided as the bill is now phrused, it matters not that the foreign exhibitor never applied for a putent in this country. Indeed, the bill would give him provided in this country. under our copyright, trade mark or patent laws there ever a measure more clearly unconstitutional?

Our putent laws are open to citizens of foreign cour We grant patents to foreigners on exactly the same terms us we grant them to the eltizens of our own country. If any biventor fulls to take advantage of the putent lows the public may appropriate his inven-tion. A law which seeks to afford protection to foreign exhibitors at San Francisco he violation of the consti tution and our own patent laws would be class legis-lation and an infringement of the rights of the citizens of this country to use unpatented articles freely
lills such as this testify to the urgent need of some

advisory body which will point out the flaws of well-menut, but foolish legislation, and which will avoid hours of ascless delate in Congress. The patent laws are particularly sching marks for Ill-Informed Con-gressmen Hutdly a year passes but some absurd bitts are introduced which seek to curtail the very ed privileges that inventors now enjoy-bills which named privings and investors now enjoy—bills which are framed by legislators who have not the slightest realization of the part played by patented inventions in the un-building of this country, and which a well-infrarmed abeloxy board would promptly relegate to the limbs of bad dreams

### "Dual Personality" in Court

AS by Jekyll legally responsible for the crimes of Mr Hyde? This question was recently declared in the affirmative by an English Juny, but the precedent established seems rotten to point to a defect in the law than to insure justice in the settlement of such cases in the future. The case in question was notable for the scientific evidence addition to behalf of the accused.

A young engineer named George Chetwynd, of good scial standing, was charged with the theft of a motorcar belonging to one of his friends, a Doctor Barron. The necessed was alleged to have broken into the doctor's garage, removed the car, atteced its number, and us he had no money, secured some gasoline on credit before making off with the machine. A curious feature of the affair was that the accused knew where the key of the shed was kept and also where the doctor kept his supply of gasoline, but did not avail himself of this knowledge After being arrested and lodged in jail, the prisoner, appeared to come out of a trans

and professed to have no recollection of what he had

The owner of the car seems to have been willing to drop proceedings, but the public prosecutor insisted on a trial. Counsel for the defense admitted that his client had committed the theft, but deciared that, when doing so, he had been in a condition known to medical men as "automatism."

I'r Parry Jones, of Derby, stated his belief that the

It learny Jones, of herby, stated his belief that the case was one of automatism, and that the accused was not morally responsible for his actions. He cited a number of similar cases from medical records. The weightlest evidence, however, was that of Dr.

Hyslop, one of the highest English authoriti all diseases. He pronounced the condition of the ac-cused to be one of mental automatism, which was nildway between somnainlism and a minor form of collision. In such a condition a person may perform complicated mental and physical actions, yet have no recollection of them on recovery. Unfortunately for the accused, Dr. Hysion declined to qualify the case as one of insunity, and this technical distinction, coupled with the inelasticity of the laws, probably left the jury no alternative but to decide as they did. The same expert raised a curious question in ethics by stating, on cross-examination, that (to quote the report of the case in the *Times*) "there were cases of mental automatism in which the abuormal irres sible self knew at the time what it was doing, but the normal self would have no recollection of it" in other words, self A knowingly breaks the iaw, but before the case comes to trial has ceased to exist, and is replaced by seif B, which has no knowledge of the crime—in fact, did not commit it. How is justice to be done in such a case?

lu his charge to the jury the judge took an easy

way out of the difficulty by adopting a skeptical atti-tude toward the mental phenomenan in question. The jury found the accused guilty, and he was sentenced to four months in jail,

Of course, the outstanding fact is that, regardless of the merits of this particular case, the phenomenon of dual personality does sometimes occur, and may lead to a situation analogous to that of Jekyil and If Hyde knowingly does wrong shall Jekyli be published? Probably if such cases were more common the law would provide for some form of restraint, as in cases of insanity, but would not inflict the opprobrium of a juli sentence upon the unfortunate possessor of a dual personality only one of whose "egos" was addicted to crime

### Painting the Town With Phosphorescent Paint

VERY clear day there is poured upon walls and buildings an immense amount of solar energy, causing in many instances such a glare of brightness that men adopt various scre studies to relieve the strain mon the sensitive nerves stacies to renew the strain upon the senior between con-of vision. The only attempt that appears to be made to utilize these surfaces seems to be the requirement, in certain large cities, that the rear and inner walls of buildings shall be painted white, in order to check the absorption of light, and relieve the darkness of inner orts and ventlitting simfts. Every day this brilliant display of solar energy is allowed to be absorbed, reflected, dissipated, while upon every succeeding night there is expended a costly effort, in power-houses, gusworks, and off-combustion, to produce such feeble ef-forts at illumination as will render possible the pro-

ioris at mumination as will render possible the pro-longation of activity for a few hours. In view of the results which have been attained in the efforts to utilize storage methods for the electric current, it seems most desirable that some similar system for retaining at least a portion of this illuminatsonshine may become practicable

It is well known that there are a number of subes which possess the so-called power of "insola" that is, the capacity of being so influenced by the action of the rays of the sun as to emit a cerdegree of luminosity. Although the substances which have been most generally employed for the demonstra-tion of this peculiar property are numerous, the power is possessed by them in a rather feeble degree, and the best of them costs considerably more than would permit its general employment. It seems possible, how-ever, that the property of emitting tight for a consid-erable period of time after exposure to brilliant suneraine perion or time after exposure to brilliant sui-light, as possessed by the sulphides of calcium or stron-tium, for example, might to developed to a far higher degree if the subject were investigated with the same care and skill as have been given to the examination of materials for the manufacture of incandescent gas mantles, for instance it seems probable that a thormanties, for instance it seems probable that a thor-ough and vigorous study of the subject of phosphor-escence, and the development of new compounds for the increase of the property of insolation, would place the matter upon a commercial basis to an extent comparable with other methods of deriving artificial illu-

The method of employing such phosphorescent mate

rials would be so greatly simplified over existing systems of lighting, as to demand interested attention. All lath would be necessary would be to prepare the material as a point and spread it upon the surfaces of buildings, especially those exposed to brilliant sunlight during the day, in order to enable the same surfaces to return the stored sunlight during the night, and thus provide an automatic equalization of the light energy of the sun. The principal cost of such a method would be that involved in the preparation of the luminous paint, and in the maintenance of the clean surfac ce the operation of absorption and emission of the light would require no further attention, all mechanical devices being conspicuous by their absence. The general use of such a paint would enable the more powerful methods of artificial illumination to be limited to special iocutions, and confine the use of existing sysis to indoor service and points to which so daylight penetrated as to provide insufficient insolating action upon the phosphorescent material. Such a method as indicated seems to offer possibilities as great as any effort to discover the manner of producing the feeble cold light of the glow worm, or the firefly, and since it offers a plan for the direct utilization of one of the elements of the radiant energy of the sun which has hitherto remained uncontrolled, it appears to be well worthy of serious study. With the equipment of existing chemical and physical inhoratories, it should be possible to press our knowledge of the phenomena of phosphorescence and fluorescence to a point far beyond that now obtaining, and the reward of a successful solution of the problem would be so great in itself us to render unnecessary the provision of any other prize to the successful investigator.

### The Direction of Aerial Highways

MONG the eastern tales which M. Antoine Galland brought from Constantinople about two A land brought from Constantinople about two A himdred years ago, there was one about a mountain of indestone, which destroyed ships by attracting and drawing out all the iron nails. This was before the days of manufactured electricity and of electromagnets, and no one knew of the existence of magnetic waves which night be used to transmit signals, and help vessels instead of injuring them, but it did include the memory of the contraction of the contrac the germ of a truth which has only begun to be uppreclaied, and even as yet but little utilized. the influence of magnetism supplies not only the mag-netic needle, by which a guide for direction is provided, but il also mables shore stations to send out time sig nals, checking the chronometer, and insuring correcterminations of longitude.

It is possible that there may yet be developed such a control of magnetic lines of force as will enable air routes to be directed in a manner even more definite than the lanes in which transatlantic steamers are oper-

One of the greatest difficulties which appears in the way of long-distance aerial fourneys, assuming the practicability of continuous flight, is that of maintaining the desired direction, in the midst of clouds and fog, and in the darkness of the night. The vibration of the machine, and the difficulty of taking observations of position, even in clear weather, render it most desirable that some positive and direct guidance be furnished, not limiting the machine to such a close line as to involve possible collision with others, but indicating defaultely the route along which progress should be

Hertz has indicated the practicability of directing magnetic waves, and Tesia has proposed definite trains of electrical waves, and it seems as if further work and it seems as it turner were along these lines might result in the development of a method of indicating sir routes, independently of any observations of the compass or of celestial bodies. The existence of a definite train of waves through space, say from New York to London, which would immediately the contract of ately indicate to the airman the fact that he was in the right road, probably by the response of a sensi-tive detector, would permit him to dispense with any other effort lo direct his machine except to keep it within the path of magnetic effect, and to watch for any material deviation from the path. Such a method any material deviation from the jeth. Such a method would be wholly apart from any attempt to transmit energy by means of waves; that is, sufficient energy to be capable of use as projetiling power, but it would enable the response of the detector to assure the navigator that he was proceeding in the direct path to bis destination, in whichever direction he might be breaked.

It is not improbable that the successful intro ch directive regions would later lead to the supply of motive power through space and thus remove one of the chief practical difficulties to long-distance aerial travel, the limitations of fuel supply. Each development in such work leads on to the next, and the surest way to attain such a result as a stream of directed radiant energy over a determined route would seem to be the provision, at first, of a guiding line, which might later become something more.

#### Engineering

Turbins Casings Purchased Abread.—By purchasing the turbine easings for the battleship "New York," now building at the New York navy yard, from Cammel, Laird & Co., the Navy Department will save \$102,000 on the cost of these easings, had they been purchased of the lowest American bidder.

The Busiest Rallread Terminal.—Although the Grand Central Station, New York, is the largest, it is not the busiest terminal in America. Statistics for the year ending June 30th, 1913, showed the total number of pasengers in and out of the Grand Central Terminal was 22,403,295, whereas for the same year the total for the South Station at Boston was 38,411,507. Of this total, 28,347,399 represented pasengers of the New York, New Haven and Hartfurd Rallroad Company's lines, and 10,044,108 were passengers on the Boston and Albary line.

Sixteen-inch Gun to be Mounted.—The experimental 16 inch, one-defense gun, which was built a dozen years ago at the Watervilled Armeni, is no longer a "white elephant" at the Sandy Hook Proving Ground, to which it was sent for test. The gun stood lis train satisfactorily; but because big guns such as this went out of favor and were displaced by high-velocity, 12-inch guns, the big piece has lain for a decade at Sandy Hook. A disappearing gun carriage, however, is now being hult to carry the piece, and it will form part of the hattery of the defenses of the Panana Carlo.

The Safety of Steel Trains.—In a letter to the Now York Yimes, the well-known signalman, James O. Fagan, endeavore to make out a case against the steel of the structure than the vocal on the ground that, because of its greater weight, it is more destructive to roadbods, bridges and general structures than the wooden care. But it is not the weight of the car but the weight of the very heavy engue that controls this question. Bridges and tracks have been or should be attempthened to accommodate the great increase in engine weight, which has been so large as to render the increase in the weight of steel care over wooden care of minor importance.

"Safety First" Time Tables.—There has been a revision of the time tables of the New Haven Railroad the guiding principle of which was consideration of the safety of the passengers. The read operates about 2000 brains every day in the week, and of these some two thirds are affected, notably the through trains and long distance local trains. The running time of the New York to Boston through trains has been lacreased by from 5 to 20 minutes. When the road bed, rolling storated and grad system have all been brought up to about the first date condition it will be time to return

Demand for Tractors.—At the present time there is a good domand for automobile tractors in English South Africa, the principal reason being the epidemics of horse disease (epizootie) which cause a great dimination in the number of horses in this region, so that power wagons are becoming indispensable for carrying on agricultural work. The kind of automobile needed for local use should be of simple and substantial makeup, suitable for use with plows and harrows, and for hauling material. Efforts are being made of iate by the agricultural associations in order to promote the use of power wagons, and especially of tractors combined with plows.

Largest Marias Diesel Engine.—The recont arrival of the ship 'Wothan' in New York Harbor, is of interest because the ship is propelled by a single-serow, six-cylinder, two thousand horse-power Cardis-Diesel marine engine. Other motor ships that have come to this port, we gross capacity was about 2,000 iff. Pr and in each case they were supplied with injection air by additional engines. The motor of the 'Wothan' is a six-cylinder cogine with an injection air compressor on the engine. This is the largest marino Diesel engine in service, and the good record of the ship on her maiden voyage is another proof of the reliability of this type of drive.

Two Additional East Biver Tunnels.—It is only as the wysers alone the construction of a subway tunnel below the East River excited wide-spread futerest because of the difficulty and magnitude of the understaing; but to-day we have got into the way of building tunnels under that river almost as though they were common-place forms of engineering work. Two new tunnels are to be built in connection with the dual subway. The Interborough tunnel leaves Manhattan at Old Stip and runs under the East River to Clark Street, Brooklyn; the other tunnel to be built by the New York Mundepal Corporation will extend from Manhattan at Whitchall Street below the East River to Montague Street, Brooklyn; the other tunnel to be built by the New York Mundepal Corporation will extend from Manhattan at Whitchall Street below the East River to Montague Street, Brooklyn; the other tunnel and Long Island will be joined by twelve separate tube tunnels and by four of the greatest bridges of the world, through and over which will be about 50 separate lines of tracks.

### Electricity

Deable Telegraphone Becords—Prof. Pedersen is taking up the Poulsen telegraphone or magnetic phonograph idea and now perfects it so that creellent results are to be had. He runs a steel were between a pair of hobbins, and upon the wire are placed electromagnets nearly touching it, as usual, so that when he peaks into a steephone connected with the magnets, this gives a magnetic record upon the wire as it passes along, but here he uses two separate magnets spaced on the wire, and finds he can thus record two separates conversations on the same wire. On reversing the wire, each conversations on the beard in its awn telephone.

Stopping Trains Electrically.—Experiments have recently been made on the Havrana State Railways with a method of stopping railway trains electrically. The system is referred to as one of wireless telegraph communication between a wire strung on the roof of the baggage car and any telegraph or telephone lines ranking that the train the robably induction is used rather than Hertzian waves to convey the signal to the train. The apparatus operates either a bell or a light signal in the call of the locomotive or it will operate directly on the art brakes. The system calls for the lastallation of a sending station at frequent intervals, so that if it he desired to stop a train because of some sociden, this may be effected from almost any point alone the track.

Cadulum Storage Battery Plates.—Pörseks and Ashenback use a new process for making cadulum electrode plates for alkaline accumulators. They use cadulum obtained in finely divided form as a spongy precipitate from a solution of cadmum said. In order to obtain it, they add zine provider to a solution of cadmum shorted with zine powder and a small amount of oxide of meetry, is spread upon suitable supports for making the battery plates. Such porous cadmum electrodes are used in a coastic social or posts hath against a nickel electrode. At the first charging by ourrent, the meetury oxide is reduced to the metallic state and the mercury then envelops the particles of cadmium and zine. On thesagring the battery, the zine dissolves out, while the cadmium becomes oxyclized and the mercury remains in the same state and is not affected. The zine thus remains only temporarily in the mass, and add in rendering to propose.

Lecomotives for the Milan-Varces Railread.—There are now in use five electric hecumotives of quite a new build upon the electric railroad running from Milan to Vareas. This road is 60 miles in length and use a stirid rail with 650 volts direct current. Several substations along the road recove high tension current at 53,000 volts from a power hie, and feed current into the road used motor cars for the trains, and also one electric locomotive, but it recently had the five locomotives to which we refer built by a Milan works. These are of the Brown-bover type and have three driving whoels and two carrying wheels. On the locomotives the works of the seven when the seven had been a set of the seven of the seven had been as the are coupled to a common driving rob bar. The rod is also connected with each of the motors drive the three wheels an an officient manner. The new locomotives serve for freight and manner. The new locomotives serve for freight and spessenger trains and can make 60 milles at notur. The total weight of the locomotive is 72 (long) tons and achieves weight 45 tons.

Exhausting Lamp Bulbs at High Temperature.—A new method is used for making a vacuum in meandescent lamps or other glass vessels. Heretofore, to eliminate the last traces of moisture and exped air hubbles which addrect to the side of the glass, the lamps have been heated in a special furnace lined with aebestos to equalize the heat to a temperature of 250 or 30 deg. Cent. (482 or 692 deg. Fabr.). But all the air bubbles do not detach even at this heat, and a greater least cannot be used for fear of softening the glass, when the air pressure would collapse the bulbs. Quite lately the Berlin Allegemeine Company used a vacuum process which allows of heating to a higher point and to go even up to softening of the glass while the lamps are on the air pumps. This is done by placing the lamps in an olectric furnace in which a vacuum is made, so that there is scarcely any external pressure out he lamps and they can now be heated as high as 500 deg. Cent. (952 deg. Fahr.). Larger end tubes can be used on the isamps which is better for the vacuum process, but it is a hard matter to fuse of such large tubes for closing, when they have a vacuum inside, as collapsing may occur. An original method is used for this, and a spiral wire electric heater surrounds the tube so that it is softened and can be drawn out while still inside the furnace, and the closing off of the lamp thus effected without air pressure on the outside. When this is done, the furnace is allowed to cool down to 350 deg. Cent. before opening and putting on the atmospheric pressure.

#### Science

As Austrian South Polar Expedition, now being organized, is expected to sail from Trieste in May, 1914, under the leadership of Dr. F. Konig, of Graz, in the ship "Deutschland," recently used by Leut Flichner's Alatactic expection. Dr. Konig is a geological and an experienced Alpine climber, and dook part in Flichner's expedition to Spitzbergen in 1916.

Geocentric Altitudes of Mountains.—In our sense MI, Everest is the highest mountain on the globe, but in another sense it is overtopped by at least 25 other peaks. Prof. August von Bohn has eincludated the "geocentric" attitudes of 31 high mountains, a c., the distance of their summast from the center of the card. Chimborazo, in the Andes, stands at the lead of the bet, Everest stands near the bottom, and is, geocentrically, about 1.3 miles lower than its South American rival

A Mining Exposition will be hold in Hortscultural Hall, Philindelphin, the week of Netoker 30, no connection with the Annual American Mining Congress. It will include, among other things, outhiet of noting mechanicy resone and first-aid appearance, and artest appliances several lag coal companies well send resone and first-aid crows, which will give exhibition drills, which the United States Bareau of Minics will be represented by one of its earlier was and a proked crew of helmet men Annung the industrial cellulate it is proposed to have a gold-onlining early in till operation, with a mile envising the continuous and in the continuous continuous and continuous continuous and continuous continuous and continuous cont

The Sanitation of Soda Fountains, "An urgent and apparently neglected question is discussed by Dr. W. S. Rankin in the Bulletin of the North Carolina Bloard of Health. This writer fluids the solution of the problem in the use of paper parafill on upus and sancers. These can be sold at about half a cent apiece. In the process of manufacture they are dupped into metical parafill, and are practically storile, they are put up in stacks, and in using thom at the fountain the attendants do not touch the inside of the cup or the upper third of it. Of course the cup is thrown away after once being used. The spoons used with the cream should be dipped into antiseptic solution before the customer is served.

Water Power Development in the Scottish Highlands are discussed by Mr. A Newlands at the last meeting of the British Association. The possibilities of the Highland region in this direction appear to have beginning arrivingly neglected. Its logid mountain ranges, lochs fed from large drainage areas, a canfull ranging from 30 to 100 inches per anium at high altitudes, steep and rapid rivers, good transportation frechities, and sturdy industrial population seem to mark it out its a favored site for hydrachetric undertakings. A start has been made at Kinlochleven and Foyers, where the British Aliminium Company already generates 30,000 and 7,000 lores power, respectively, and there are a number of smaller installations, but for the most part this field is un-worked.

Wireless Weather Reports for Marlners, usued by the United States Weather Bureau, are now distributed broadcast every coming shortly after 10 o'clock by the Naval radio statems at Radio (Arington), Va., and Key West, Pla. The report consists of two parts, the first gring in a simple figure code the harometric pressure, wind-direction, and wind-force (on the Beaufort seale) provailing at 8 o'clock the same evening at Sydney (N. S.), Nantuckel, Allantic City, Cape Hatteras, Charleston, Key West, Penancols, and Bermuda, the second giving, in words, a forceast of the probable winds for the next two days over specified sections of the Atlantic and Gulf of Mozico, extending about a hundred miles offshore, and warnings of severe storms as occasion

Radium Emanation in Medicine. The distinguished English surgeon, for Frederick Twees, recently stated that radium emanation is just as effective for curative purposes as radium itself. Assuming that radium is really the valuable therapeute agent which it appears to be, the amounteement is of great unportance. Its data is extremely precious, for a small quantity of radium can require a small productive of the produce practically an unhunted quantity of very cheap emanation. Radium canantons contained in scaled metal applicators are being sent off daily to all parts of England for medical one to use on their patient who cannot attend the Radium Institute. In a space of ton days cemantons equal mentarity value to \$85,000 worth of radium have been sent out. Radium emits three sites of rays, designated respectively by the Greek letters, "alpha," "botal" and "gamma". The first two destroy the healthy tissues of the body when directed at close range, and at greater distance attimitate the abnormal tissues of tumor to renewed growth. The "gamma" rays are those which are desired. The more or less undesirable "alpha," and "beta" rays are filtered out by lead sersons, through which the hard "gamma" radiations pass easily.

### Gasoline Slot Machine

T AKING its one from the fortunes that have resulted from the harvest of pennies dropped into chewing gum slot nuchines, a nd with the adventages of such automatic vending devices apparent, a Michigan company recently has placed on the market the gasoline vending slot machine that is shown by the accompa-ing illustration. The machine, which quite as automatic in action as are its gum vending predecessors, has a numb of features equally attractive to the man in his money and receives line, and to the man who puts in the gaso line and receives the money. In opera-tion, it is merely necessary for the person requiring gasoline to drop a fifty-cent piece in the slot, place the end of the flexible hose in his gasoline tank and turn the crank. The machine is equipped with a gage-visible in the picture-to show whether it is full or empty, and even if a person should inadvertently piace his money in the slot when the tank is empty it is promptly returned at the first turn

of the crank, just as your penny is returned when the chewing gum slot machine is empty Of course as much more than fifty cents worth as is wanted can be obtained-up to the capacity of the tank—though a fifty-cent piece is the only coin that may be put into the slot. So that the device can be used anywhere, regardless of the fluctuating price of fuel, it is equipped with a metering mechanism which can be adjusted to deliver the proper amount of gase line for the amount of money put into

The machine that is shown by the

The machine that is shown by the picture has been installed by a garage proprietor in the city of Lansing, and he is particularly "tickled" with it, for it is particularly "tickled" with it, for it requires no attendant, is positive and unfavoring in action, is always ready to serve anyone with the necessary coin, and ieft to itself dispenses some 200 gallons of fuel a week. As the machine requires no attention once it has been properly installed, it is obvious that garage propri tors are not the only ones who may benefit by its usefulness, anyone may install one and be assured of a profit Not only does the machine run without attention other than that required in filling the "gas" tank, but it is canable of "delivering the any minute in the twenty-four hours and any driver who knows of its location has no need to awaken sleepy garage attendants in the middle of the -provided he is able-to obtain the

wherewithin to get home
On the other hand, it is evident
that a vending machine liable to hold fifty or a hundred half-dollars would be a mag net for thieves unless placed where

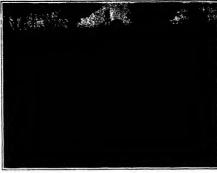
would be constantly under the eye of an attendent.

### Combined Piano Player and Talking Machine

THE deficiencies of the phonograph in the reproduc-tion of plano music are only too well known. In most of the vocal productions, the accompaniment, if played on the piano is often so weak and banjo like that the piece would not suffer much if it tirely omitted. To overcome this defect,

attempts have been made to supply a real accompanient by using an automatic plano-player with the phonograph. But the difficulties of synchronizing the two instruments have hitherto been deemed almost insuperable.

Recently, however, an inventor has succeeded in combining the two instrum so that they are perfectly timed. This he accomplishes by purumatic means con-trolled by a series of perforations in the music roll. On an SS-note player, the duct for the highest note, which is seldom used in the score, is utilized to control the pneumatic coupling. The exact method the inventor is not ready to disclose at the time, as his patents are still pend ing, but apparently the music roll is brought into synchronism with the phonograph record at each turn of the latter It is the phonograph that controls the tempo of the player-plano. The operator of the player-plano does not touch the tempo controlling lever, but he may operate the expression lever, or control the



A casoline slot machine for automobilists

volume of sound by pumping harder or softer as the case may be. Any standard player-plane may be used to which a small attachment is applied, but the talking schine requires special apparatus for the control of its motor mechanism. Otherwise the talking machine is also of standard make and standard records may be

mental record is made by an expert, who



A nantagraph cutting on metal with a burning let.

plays an accompaniment on a pieno electrically connected with a recording mechanism, while the vocal selection is being produced by the phonograph The music roll is then cut in acco rdance with the record,

music roll is their cut in accounts and and reproduced in the usual way.

The arrangement is such that the player-plane may play a prelude of any desired length, after which the playenorgraph will start up automatically. As the shaper retards or accelerates, the player-plane will corre-



Talking machine and player plane operating in synchronic

spondingly year, the vocal selection with a stop, playing, or if decrees, it plane may play a pestitude. It is combined mechanism in

### Pantagraph Which Dunys Steel With a Point of Fins By Henry Harrison Suples

BOM the earliest times it has ! sumed that a given material win he cut only by the use of another and harder material. To-day it is being learned that the hard, keen edge of the cutting tool ible action of the burning tool, by the inse beat of the oxygen-acetylene bl

The old idea of the use of heat in in The our spee of the use or near in the im-pression that a very large quantity of heat necessarily accompanied all opera-tions which required very high tempera-tures. It is now well understood that

re exists, in the oxy-acetylene gas hurner, a work man's tool which is giving him vastly increased capabilities, not only in operations such as welding and fusing, but also in cutting through steel, even of very considerable thickness. Instead of a hard and keen cut-ting edge, the new tool does its work with a point of such an intensely high temperature that nothing can restst it, while the total amount of heat evolved is so

moderate that portions of the metal im-mediately adjacent are unaffected.

The power which such a tool places in the hands of the intelligent mechanic is enormous, and, in fact, can be appreciated only by those who are familiar labor and energy formerly required to cut an irregular shape from a piece of tough and resistant material. To be able to cut out a piece of any desired shape, simply by passing the almost invisible apex of a by pa cone of combining games, is such a revolu-tion in the art of the mechanic, that its

possibilities are, as yet, scarcely grasped.

In order that such a powerful device
may be used to the highest degree of efficiency it is desirable that special apparatus for use in connection with various operations should be devised, and conside progress has already been made in this direction. The ordinary cutting tool has to be used in a machine tool wh capable, not only of holding the work and of providing the desired movements, but also of enabling sufficient power to be applied to force the cutting edge through the resistant metal. When, however, the cutting edge is replaced by the inte

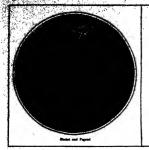
point of the new tool, there is little need for apparatus for holding the work, or for power to propel it. All that the workman has to do is to move proper in Art has the working mass to up it is more the light and convenient the over the surface of the metal which lies quietly before him, and the path of the apex of gases, with its six-thousand-dagree temperature, appears as a clean cut through the metal. The power required for the steel tool is replaced in the new method by another form of energy, by the heat of the jet, an infinitely more direct application than that

which required the transformation into power through the medium of furnace, boiler, and engine, and the losses of transon by belting or electric condu

It is desirable, however, that some method be provided to aid in guiding the movement of the jet over the surface of the metal. The power of the flame renders any faise movement irrevocable, and there should be no uncertainty in its movements. The very nature of the operation renders the use of any ordinary template impracticable, and it is not easy to follow directly any marks drawn directly upon the surface of the metal.

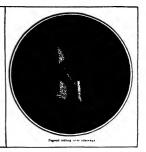
It has been found, however, that as an apparatus originally devised for use in the drafting room for conving and enlarging drawings, the pentagraph may be em-ployed most satisfactority, only instead of drawing with a pencil upon a sheet of paper, it ests through a plate of steel with

distance from the reproducing point, the



### Pégoud's Remarkable Performances

What Coolness and Nerve Can Accomplish



A LTHOUGH the name of Pegoud has been acciaimed in all the newspapers of the world, his remarkable exploits still factionte. He has shown that a cool head culish undreamed of marvels in a flying machine, and that if an aviator is high shough he can always save himself if he side-slips or capsises. As the accompanying illustrations show, Pagood has deliberately placed himself in the most precarious positions conceivable—positions in which unfortunate a fators have found themselves in the past and have plunged to their doom. Pégoud's performances are therefore not to be lightly dismissed as worthless and reckiess acrobatic performances.

A writer in Flysh, who evidently witnessed Pégoud's flights, makes some interesting comments on flying up-side down and on "looping the loop" in a monoplane. There are four definite and distinct feats in Págoud's

re, we are told.

The first is illustrated diagrammatically in Fig. 1.

and in order to a void confu sion it may be these diagrams are drawn in is to say, they show the path of flight as it ears from the side of the machine. If this page is held upright, then the diagram repreas possible does against the background of the sky.

failing to the ground its tail gradually "elevates" and awings the machine, pendulum-like, into a head down position. Pégoud allows this swing to repeat itself sevral times before he finally brings the machine into

Now, setting aside for the moment the natural curios ity of the crowd in the sensational part of the performance, and in the prodigy of a men who does these things with such sang froid, what is its serious or scientific

aspect?
Mr. Norbert Chereau, general manager of Blériot
monoplanes in England, assures our England contemporamonoplanes in England. ary that Pégoud's machine was built as a standard 50horse-power single-seater in 1911, and that the only aiterations made for the purposes of these flights are

1. A new pylon made 12 inches tailer and placed inches farther forward.

2. Substitution of the original tail by one used on

doing the same thing. In a word, t'égond is the per-

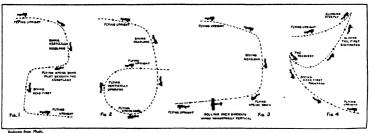
rect numan automaton.

"Instead of controlling the machine, Pégoud lets the machine control itself. From the standpoint of the scientific experimenter, he is the ideal pilot, for he has the lottelligence to eliminate himself at the moment that the machine enters upon its appointed task. He files it with the utmost skill to the desired attitude he turns it head downward toward the earth, he drops like a stone with it until he has acquired the momentum necessury to effect his purpose, and then he calmly deliberately pushes forward his elevator lever and sits still while the machine flattens out on its back

"The amazing thing is that the man himself can retain his composure in positions that are actually nameating to the average person.

"The scientific interest in Pégond's achievements iles in the fact that they are the most complete full-scale demonstrations of the fundamental principles of flight

> beeu carried out. Every aeropiane worthy of the name is inher-ently stable within certain limits. By this is meant that when an aeropiane is prop erly designed. will naturally support it-self on a level keel at a certain speed, and will us turally tend to recover that position if the disposition of its surfaces is



The positions assumed by Pégoud when flying upside down, "Gooping the loop," rolling over sideways, and diving tail first.

ers take place at a great sititude, and to a certain extent that are thus witnessed by the spectators from beneath, which tends, naturally, to foreshorten the ap-

parent vertical distances.

Fig. 1 shows an absolutely vertical dive followed by

Fig. 1 shows an absolutely vertical ure indicated of a "flattening out" speeds doors.

"In an ordinary steep glide," comments the writer in Filphi, "the machine is "fattened out' so as to bring he pliot into an upright position once more in his own special feat however. Pégoud just tucks the head of his Blériot monoplane underneath him, and flattens out

"Having down upside down for some little distance, he then dives again, and flattens out the right way up. The whole maneuver is controlled by the use of the

The wave absenced with the pilot on the outside edge. Pégond dives as mani in order to gain momentum, tucks the nose of his machine under him and the control of the contro elevator lever well forward, he continues his circle until he comes to the top of the arc, where he is flying level, d right way up once more. This maneuver is shown

and right way up once more. This immediate is above in Fig. 2.

"The third contortion involves the use of the warp as well as the elevator. Fulling vertically head down as before and turning on to his back, Pegond warps his wings to the utmost limits of the control and rolls over addeways into an uprint position. This is shown, as clearly as it is possible to do so diagrammatically, the RM 2"

in Fig. 3."
Theirs remains yet one other "standard" accomplishment. Pégoid climbs steeply upward until his machine demos to a itandatill, and so be provides a deliberate tall sides; the machine slips beckwars, but instead of

a standard tandem-seated model. Neither of these afterations affects the principle of the machine or its "nat-ural stability." It is apparent that the purpose of the talier pyion is to set the top bracing wires to the wings at a less acute angle, and thereby to reduce the stress upon them. "This is a very natural precaution in a machine that files, so to speak, habitually on its back, and in which the top wires, therefore, so frequently take all the weight of the machine in the air. Ordinarily, the top wires merely support the weight of the wings when the muchine is on the ground and their severest stress comes, generally, from a bumpy landing. On Pegoud's Blériot, however, they frequently support the entire weight of the machine in flight."

Similarly, the advanced position of the pylon puts the top front wires in a better position to reinforce the wing against the force of direct resistance.

The tandem model tail is larger than that on the

single seater, and gives the greater measure of control that is desirable for extraordinary feats of this descrip-

tion, but not necessarily so for everyday Bying.

"We have, therefore, a perfectly normal seroplane,"
continues Fight, "combined with a perfectly abnormal
pilot and the pilot is abnormal hot in performing compilot and the pilot is abnormal not in performing com-plicated and rapid movements of the control with the dexterity of a Padecewski. but in having the serve to 'sit still in the most trying actitudes while his machine continues properly' to earry out the evolution on which le initially caused it to begin and wiggled his control lever in servous uncertainty, he would end up in a beap on

the ground just as eathely as any other pilot does in a similar plight. Figured is marrislous because he under-stands precisely what his marchine is going to do, and knows precisely how long he desires it to keep on

not tampered with The control of a modern aeropiane gives the pliot ample scope for destroying the natural stability inherent in the design of a machine, and many an accident is caused through the abuse of the control. the proper use of which is, of course, fundamentally necessary for the purpose of steering the machine ou its appointed course

### Ten-day Courses in Agriculture

W inter institutes for farmers, at which ien-day courses in all kinds of rural subjects are offered. are becoming a regular feature of educational work in Canada. For several years such an institute has been in operation each winter at Truro, Nova Scotia. Last year the attendance at this place numbered about of whom 100 were from Prince Edward Island and a large number from New Brunswick, these two provinces subsidizing all of their inhabitants who wish to attend Recently Prince Edward Island has established an institute of its own at Chartottetown. The courses offered here include livestock, poultry, horticulture, soil cultivation, seed selection, and dairying, besides women's courses in housekeeping, domestic science, etc. These courses are given free to all inhabitants of the island who care to take advantage of them, and attendance is further encouraged by a bonus of \$5, together with e transportation, to anyone who makes prior application and theu completes a course satisfactorily. examinations are held, the pupils being only required to give intelligent interest throughout the tessons; thus the older farmers, as well as the younger, are en-couraged to attend. The courses, which are us practical as possible, are given by experts from all parts of

### Correspondence

editors are not responsible for states made in the correspondence column. Anonymous com munications cannot be considered, but the names carrespondents will be withheld when so desired,]

#### The Humane Animal Tran

To the Editor of the SCIENTIFIC AMERICAN:

l have read with some interest the communication of Mr George Foster Howell in the SCIENTIFIC AMERICAN Mr George Foster Howell in the Scientific America.

of September 13th, 1913, in regard to the errotty of trapping for wild animals, especially for foxes. I note that Mr. Howell's address is Brooklyn, N. Y., so I suppose he newer experienced having his poultry and lambs ravaged by foxes. I have had opportunity to I have had opportunity to to his victims. When a boy observe Mr Fox's cruelly to his victims. observe Mr Fux's cruelly to his victims. When a boy the first living for 1 ever saw had a live chicken in his mouth. I seared the fux; he dropped the chicken, which was not dead, but lacerated and wounded to the death. I have seen turkeys where force had caten a portion of their bothes and left them to die in pain. The article referred to reminds me of the fable in Asop. where the welf criticizes the men for slaughtering the It is well enough to hear both sides lamb. It is well enough to hear both sides. If the Massachusetts Society for the Prevention of Cruelty to Animals will get some Prof. Garner to teach them fox talk and instruct sly Reynard to carry firearms for his victims, they might prevent more cruelty by improving traps.

W. R. SMITH. Woodbury, Tenu. WOODDUTY, I'em...

W. R. SMITH.
(Our correspondent misses the point, we fear. His
is the "eye for an eye, a tooth for a tooth" doctrine
Because foxes are oruel (what animal is not?) that
is no reason why man's traps should inflict pain.— EDITOR.

### Is Engineering an Exact Science?

To the Editor of the SCIENTIFIC AMERICAN:

Having read all the matter that has been available to me, I write to ask you if no attempt has ever been made to stablize the hills that have been sliding into the Panama Canal prism Piers in a river supporting long spans often form an nee gorge, and they are constructed spane often form an negarity, and they are constructed in such a way as to offer the least possible opportunity for a collection of ice. It seems to the writer that some means by which the earth could be halted and held is far from an impossibility

That much money has been spent for surveys and

boring on the route of the canal is well known would like your opinion of inginiering as an exact science when it was estimated after exhaustive work that the Culebra cut banks would stand at an angle of about 33 degrees from horizontal, and that in practice they are still moving and at an angle of about 7 degrees.

Cowles, Neb F. A. Good.

[The sides at Panama do not vitiate the claim of engacering to be an exact science. We doubt if even engineering to be an exact secured. We down a even more expensive borings would have revealed the fact that the Culchra material was so mistable as to require a slope of 1.7—which could be demonstrated only when the cut was fully opened Engineering as "exact," if the conditions can be foreknown.—Euron 1

### Reversing the Locomotive

To the Editor of the SCIENTIFIC AMERICAN:

If it is not prolonging the discussion on "Reversing the Locomotive" beyond the point justified by its importance to your readers, I would like to add these few comments

The correspondent in his letter on this subject in the issue of September 20th has very clearly explained how it is possible to retard a moving locomotive with only the use of the reverse lever and throttle. That the above is possible to obvious to anyone who intelli-gently considers the matter, and that it was possible was not denied in my letter printed in issue of July 5th; your correspondent to the contrary, notwithstanding. I lord misinterpreted your editorial comment of June 21st to advocate an automatic stop which would utilize only the reversing power for retardation, and pointed out the asclessness of such a device As to the question of the engineer relying upon the

returdation from the reversing power, if he must first prove to bluself that the air-brakes are in then close the throttle, then throw over the reverse level, and then "gage the steam so that he will get very nearly" the ultimate tractive power for retardation. he would by this time have gone down, in most re emergencies, as a marter to duty. In the case of the wreck at Stamford on June 12th the engineer probably would have had less than 15 seconds to complete the four above operation

It is certainly absurd to advocate makeshift prac-tices which were used in connection with locomotives before they were equipped with air-brakes to be apperior they were equipped with the modern reliable piled to locomotives equipped with the modern reliable air equipment. As pointed out in the editorial com-ments on this subject in the bone of July 5th, when all other means have failed in retarding the train, reversing the power should be used as a last resort, just as a drowning man would grasp for a straw, and should sever be relied upon when there is the slightssibility that the air brakes are of est po is not as easy to determine, quickly, in the moment of mental stress as it might be supposed. At present it seems to me to be only a remote possibility that such a principle could be incorporated in an automatic stor

I wish to thank you for having allowed me the valu-I wish to thank you for my previous communic able space in your paper for my previous communic W. L. HENZ.

### Sailing Hydroplanes

To the Editor of the SCIENTIFIC AMERICAN:

I have noticed with interest the development in the last few years of the motor-driven hydroplane, but I have seen nothing of any sail-driven hydroplanes. I am sure that if a cup defender is desired that will run

have seen nothing of any ani-driven pydropianes. In a sup defended is desired that will run away from anything sies driven by the wind, a salidiven hydroplane is what is wanted.

About fifteen years ago my brothers and I used to sail boat roses on the ponds. It was too much trouble to make a hollow-hulled boat, so we fashioned out by taking a ploce of shingle scross one end, sloping upward forward at an angle of shout 25 degrees, then fastening a piece of shingle scross one end, sloping upward forward at an angle of shout 25 degrees, then fastening a cross-bar to a short mast which was stepped in this cross-law and the state of the st that we had a rough hydroplane with outriggers. that we shad a rough syroppiane with outragers. As an observed a short of the but as soon as the sail began to draw it began to rise, and as soon as it had got clear of the water it was "flying." These boats attained surprising speed.

I would like to know if any of your correspondents have ever tried this form of craft. If not, I would like

cone who lives at the seashore to try it and let me ERNEST WELTMER. know what are the results.

### Is the Dunne Machine Inherently or

Automatically Stable? To the Editor of the SCIENTIFIC AMERICAN

In the SCIENTIFIC AMERICAN of August 23rd, page 139, under Acronanties, I see that a flight across the Channel has been made in Dunne's self-balancing

To this aeroplane is attributed a while it is only inherent stability, which is not sufficient

under all circumstances.

The difference between automatic and inherent stability may be seen in my article in the Scientific Aranacon of December 17th, 1910. "Distinction to be made between these properties of the stable of t The difference between automatic and inherent stabil-

out the executed parts.

That I antedate and have the priority over Dunne, Fokker, Lohner and many others, is proven by my patent drawings of 1902, and by my article in the SCHENTIFIC AMBRICAN SUPPLEMENT, 1982, of March 28,

With my acroplane no further experiments could be made for lack of funds, and likewise other now very much needed experiments concerning automatic balance propulsion, etc., cannot be made, for the same reason, propulsion, etc., cannot be made, for the same reason, respectively because there is no experimental station in America, where inventors can get their inventions tried out, without cost to the inventor, who, as a rule, has not rufficent funds for that purpose.

(larkwille, Torm. Thuso. Giron.

#### The Stratosphere To the Editor of the SCIENTIFIC AMERICAN:

To the Editor of the Scientific American: Referring to the last lines of your notice on page 159 (August 30th last) to my paper read at the R. Met. 8. on Air Currents at fifty miles: "These conclusions hardly agree with the prevailing conception of the stratosphere as a region of gentle wind," I may point out that we have no authority for stretching the stratos-phere beyond the limits explored, say up to 15 miles or saibly a little mo

saibly a little more. The velocities at fifty miles are quite in agre

with previous records of moteorie trains, but rarely if ever before have such complete records been available by which such definite results could be obtained. These results have been confirmed by the great authority motoric ecience, Mr. W. F. Denning, of Bristol, wo ing to a large extent on independent data

J. EDMUND CLARK.

Whether the stratosphere extends up to fifty miles is mainly a question of terms. Dr. Alfred Wegness has roomely incroduced the idea of a "hydrogramphere" beginning at about that altitude, and of another "sphere"—the "geocoroniumsphere"—very much ligher; but most meteorologists still think of the atmosphere as but most meteorologisal stat large of the autoopsees and divided into two main strata—the troposphere and the stratosphere, or isothermal layer. We did not intend to question the accuracy of Mr. Clark's observations—which are in accord with those that have been collected and discussed for several years past by Dr. C. C. Trow-bridge in this country—but to point out the contrast that certainly exists between all these meteor train observand an idea that seems to have crystallized in tions and an idea that seems to have crystallized in recent meterological literature; vis., that the whole upper atmosphere is a region of gentle winds. A marked falling-off of wind velocity in passing from troposphere to stratosphere is regularly shown in aerological observa-tions, notwithstanding the great horizontal contrasts of temperature that exists within the stratosphere at all levels that have been sounded. Whether there are theoretical reasons to expect stronger winds at high levels—and whether it is not a mistake to insist upon the "non-convectional" character of the stratesphere— are questions that well merit the attention of students of atmospheric physics.—Entron.]

### Rearrangement of Star Mana

To the Editor of the SCIENTIFIC AMERICAN: I noticed in your columns for printing the personal letters of correspondents upon different subjects a letter is term of correspondents upon universe stageous a rever recently which had to do with the prevalence of error in our American geographical maps or charts. Why can we not take up the matter of the errors in our

sal star charts of to-day? The allegor allegorical star charts of to-day? The allegorical star-charts of to-day are covered with a system of figures, and hardly any of them agree as to the proper placing of those which do exist upon our maps, and truther they are apparently placed at random in most cases. We have sufficient evidence in hand now to enable us to place these figures very accurately or arbitrarily. At least usudo as he done with the most vital figures of the northern heavess proper. The original outlines in each case are presidently making eternal in so far

At least such can be done with the most vital ngures of the northern heavess proper. The original outlines in each case are practically speaking eternal in so far as man's period of existence on the earth is concerned. Each figure should be tied to the starry outlines constituting such figure in a rigid manner.

A great number of the inhabitants of the celestial

valit do not belong there at all. On the other hand, many of them are placed in a position foreign to that which they should occupy. In a great many cases they lie entirely outside of the territory which they should

cover.

In a word, we need a new survey of the sky very badly. Our star charts are very obsolete in this respect.

Can we not get our astronomical machinery busy upon the table to the sky were unti-date or within back to. the job and make a more up-to-date or rati date set of charts.

The Great Bear or Ursa Major will lose to the Lion and Buil of course. In fact, he will lose out entirely. Copheus Buil of course. In fact, he will iose out entirely. Cepheus will be seated upon his throne and adjusted to the proper position and proportions for the first time in some thousands of years. Andromeds and Prometheus will be rivals for the possession of the huge human figure which overspreads the galaxy from the region of Lacotta. to Ophiuchus, or a distance of some two thirds way

which overspreads the galaxy from the region of Lacorta to Ophiuchus, or a distance of some two thirds way across the visible sky.

Off in the southern heavens we shall have to undertake a general overhauling and must of necessity "paint that part of the town red." Here we shall have to recurrect the menagerie or circus of animal forms which belong there by divine right, deterioning a number of usurping inhabitants who are undoubtedly aliens in that locality. The monkey or age tribe predominate in the region of Pegasus and Aquarius and are very naturalists and real in form and proportions. The three monkeys in southern Aquarius are very lift-like little follows and seem very intent upon their besiness, whatever that may bu. The head in onlymetics with the lower fish of Pisces approximates very closely to that of a dog, still it is not difficult to see how the Egyptian could have made of it the smooth dog-cared aps representative of Thot. It is also very apparent that it has been seen as quarding the entirance to the lif-capital place of this locality of the heavens.

We have the major figures of the notibern heavens proper very accurately destrining from. Will you start a revolution to outst the many allows and saurpers as revolution to outst the many allows and saurpers as revolution to outst the many allows and saurpers as revolution to outst the many allows and saurpers as

a revolution to outs the many aliess and neurpers as well as to readjust the native inhabitants to their proper spheres? The data are self-evident truths, once our at-tention is called to the different forms. Pueblo, Colo.

### Earthquakes and the Panama Canal

A Study of the Geological Conditions on the Isthmus and What it Reveals

THE earthquake belts of Central and South Ameri are approximately coextensive with the regions of fairly high mountains. Within the Bepublic of Panama mary man mountains. Within the Deputher, or Januars there are few, if any, mountain ranges, properly so-called; but there are high mountain groups. The older geographies informed us that the North and South American Cordillerars were practically use continuous chain from Alaska to Cape Horn. This is quite incorrenti from Annua to Cape roots. Into its queen new-rect, for the mountains of Panama, Casta Rica, and some of the other Central American republics are younger than are the great ranges of the western States, and are units quite distinct geographics! If from the greater northern and southern continental ranges. Furthermore, they have had a different origin, for they are not due to folding by lateral pressure, as the mountains of western America chiefly are, but originated from intrusions of volcanic rocks, as necks, cores, masses (Fig. 1) and irregular dikes (Figs. 2 and 3). These intrusive rocks are of five broad types, which, given in the order of their importance, are: basalts diorites, andesites, granodiorites, and some rhyolite. Ir their original molten condition, they were injected up through volcanic agglomerates, brecelas, and tuffs; and sandstones, argillites (Figs. 2 and 3), limestones, and ds, mostly of Oligocene age. Most of the bedded rocks cut by these bodies of igneous, or volcanic rock, are not very well consolidated, except in the vicin ity of the higher mountains. There they have undergone some induration and slight baking, due s of formerly hot lava rock which was injected into them. The basait, and esite, and rhyolite intrusions are mostly post-Oligocene, and seem to be gely Miocene in age. The diorite is, at least in part, pre-Oligocene, probably of Focene time. that the earthquakes are coextensive with these moun-tain groups is evidence that the latter, at least locally, have been mushed up beyond the stability of their foun dations, and are even yet slowly settling back to adju ment. Both Gold and Contractors' Hills ure, on a small scale, such settled down masses, as will be explained later. There are only two peaks within the Canal Zone that reach up to elevations of approximately 1,000 feet, and there are no peaks within thirty miles of the canal that are higher than 2,000 feet. Not within one hun-dred miles could one find mountains over 4,000 feet in elevation. Therefore, the canal is far removed from the at mountain masses, the settling and adjustm which might cause cumulative stresses, that would culminate in rock ruptures great enough to give destruc-tive earth vibrations. Furthermore, the relative weakmost of the rocks within the Canal Zone region prohibits the accumulation of stresses sufficiently great to cause violent rock rupture, with concomitant earth jars of destructive proportions. Theoretically, then, we would expect the Canal Zone to be well outside the Central American earthquake belt. This is quite in accordance with the facts of observation as given in a long and fairly complete record of the quakes that have occurred from the time of the Spanish conques to the year 180

The Earthquake Record of Panama.

In all last states and off to the presents only two covere shocks were noted; to not of these, in 1621, destroyed many of the buildings to Panams, and one in
1882 damaged several buildings and bridges, and locally
threw the rallway track out of alignment. In Colon
the latter quake is said to have opened a few creviers,
and to have been attended with some fatthicts. Very
many smaller shocks have occurred, and since the installation of seismographs by the Jathman Canal Commission, numerous termors, most of which jare detectable only by instrument, are recorded every month.
The liability of the casal to injury and destruction by
earthquakes since 1821 would have affect is that
no earthquakes since 1821 would have no encountered it,
and the shock of that year, though severe seough to
shake down adobe houses, and even some masony
structures, would have had no serious effect on canal
slopes, and little effect on such rock founded, solid concrets structures as the looks.

It is interesting to note the difference between earth tremore, caused by a heavy black and those due to sarrhéqueise. This difference is clearly registered in ""Trembignessés de Turre et Braytion Voicalques au Castre-Anorique, par 9. de Montesseus de Baljora, p. di, fecilés ées déchose Matardies de Bane-et-Léra, 1989.



First vessel through the Gatun locks.

The tug boat "Gatun" passing from the Atlantic Ocean to Gatun Lake

The recent occurrence of two carthundes hacks at Panama renders timely the following article by the evoluties of the Inthima Canal (commission, Although the shocks were sufficient to alarms the native labovers from the West Indies, used as large are to such tremors, colonel (includals reports that not the slightest taying usus done to the canal. This proof of the tability of the works came a day or two after the first panago of the Gatun tocks by a venal, a shore th our historic (intertation—Dorros.

the different effect which each produces on the sciamograph. The instrument at Ancon is a 100 kilogramme, Bosch-Amori, which magnifies earth waves too times.

Aucon Quarry has been the theater of considerable heavy blasting. It is 3,100 feet S. 61 deg W. from the instrument. Some of the blasts there, and their results, are as follows:

 April 8th, at 5.25 P. M., 10.700 pounds of dynamic cylloded, recording stancia awang 20 millimeters north and 0 millimeters south, 75 millimeters east and off the paper, thus giving no back swing to the west.
 March 2nd, 12:30 P. M., 6.000 pounds of dynamic

 March 2nd, 12:30 P M, 6,000 pounds of dynamite gave a vibration record of 6 millimeters north and 1 millimeter south, 11 millimeters east and 5 millimeters west.

June 2nd, at 5:10 P. M., 4,000 pounds of dynamite swung the stenctis 11 millimeters north, 2 millimeters south, 5 millimeters cast, 2 millimeters west.
 April 30th, 5:15 P. M., 1,200 pounds of dynamite caused the stencils to swing only ½ millimeter on each caused the stencils to swing only ½ millimeter on each

side of both lines.

5. On March 20th, 1,900 pounds of dynamite showed no north-south, and only 1 millimeter of east-west

with uncounted the state of the

In the larger blasts at Ancon Quarry the violent push given to the rocks by the explosion threw the recording stoodis over toward the east and north, with a very small aving back to the opposite directions. The motion was accomplished with not more than two, and mostly one, quick strokes, occupying 2 to 3 seconds or time. After that the vibrations were very matute and much slower, and died out antirely in 10 to 15 seconds. In the smaller blasts the distance was great enough to By Donald F. MacDonald Geologist Isthmian Canal Commission

cushion completely the first violent imputes given to the rocks, because the swing of the recording structito each side of the lines was equal. In the case of the subaqueous blasts the distance was also great enough to cushion the first violence of the shock.

A Study of Some Blasting Effects.

Some other blasting effects near Culebra were recorded on less smalltly instruments, and these, translated into approximately the terms of the standard
instrument at Ancen and Gatin, are as folions. Fourteen 24 and 28-foot holes, fonded with 2250 pounds of
dynamite, were exploded within 1,100 feet of the instrument, and gave a maximum amplitude equivalent
to 20 millimeters. Therefore an increase of nimest 120
per cent in the dynamite charge, gave an increase in
the recorded effect of only 40 per cent. Ibid of these
blasts were in comparatively soft angiliacense rock, and
were situated almost 30 feet below the top of a 200foot cut alope. This lucation, so close to the clage of a
high, steep slope, would, of course, increase the tendency to vibrate. In general, it may be said that in blast
of 5,000 pounds of 60 per cent dynamite would not
rapider on the standard Ance instrument at a distance of more than 2½ miles, under the local geodaction
conditions. In summary, then, it may be said that the
conditions. In summary, then, it may be said that the
conditions in summary, then, it may be said that the
conditions in summary, then, it may be said that the
conditions in summary, then, it may be said that the
conditions in summary, then, it may be said that the
conditions are comparatively rapid and apparently almost
wholly compressional. They consist, in quite limited
degrees, of large, slower waves or movements and sandirequired productions. Entitlements because in the other
hand, are slower and more undulatory, but they, ton,
cored major mudulatory motion, or impulses, together
will minor oscillations. The chief reasons for this
difference prolability are

a. Blasts are near the surface where the rocks are uder slight pressure, and, therefore, more chastic

under alight pressure, and, therefore, more clastic
b. Earthquakes are relatively much more decessented and are generated where the rocks are under stresses which greatly reduce their clasticity

c Blasts are quick acting shocks like the blow of a hammer.

d Earthquikes result from slower acting rock rup-

In addition to earth waves, blasting also geocentee atmospheric waves, or compressions, which travel with the same velocity as sound, because the atmospheric harand he sound from the blast always, arrive domatinacously. The earth waves from the blasts travel much more rapidly thus sound. The desper the blast, other things being equal, the greater his proportion of its energy goes into earth waves and the loss into almospheric waves. The latter often far houses more than do the earth waves, and for this reason it was for a time held by some that the "doke" or surface blasting tended, more than deep blasting, to promote sildes in Cutebra cut. Such, however, is the opposite of the fact Exposed in the walls of Culebra cut are sections of

two large volcanic cores, the Gold Hill mass and the Contractors' Hill mass. Both of these have been faulted down (Fig 1) some innufreds of feet through the surrounding softer sedimentary rocks. The sheared some around the margin of each is from 2 to 10 feet wide, and the downward drag of the Gold IIIII mass has pulled small masses of lava down over 100 feet from a former flow. This is all exposed in the face of the cut as shown in Fig. 5. Such a frictional pull, coupled with such a wide sheared zone, indicates a down throw of at least 300 feet, and perhaps much more (lold Hill rises to over 600 feet above sea-level, and has an ap-proximate area of 1,500,000 square feet. If we call its depth 1,000 feet we have a mass which weighs approxi-mately 112,500,000 loss. This mass has been fautted down at least 300 feet, but to accomplish this probably nired a considerable period of time. If, for the sake of comparison, we assume that it dropped freely one only, we find that by such a drop it would exert a ssure on its base, or strike with a kinetic energy of 225,000,000 tons. Now, P Gerald Sanford ("Nitro-Explosives," page 286) records that one kilogramme of pure ultroglycerine on explosion exerts a pressure of 19,151 kilogrammes, therefore a blast of 18,000 pounds of 60 per cent dynamile, equivalent to 10,800 pounds of nitroglycerine, would exert a pressure of 106,831 tons, only about 1/2,106th part of the pressure developed by the down drop of Gold Hill one foot. Broadly speaking,

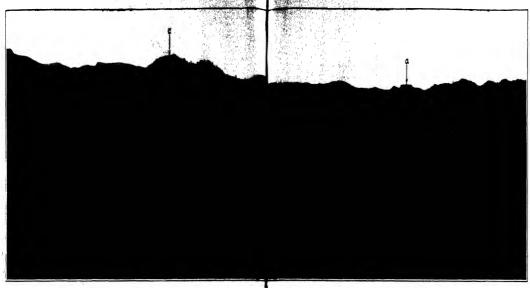


Fig. 1,-Panoranie view looking some and manward from Zion Ell. Calebra.

(c) Assoc IIII, Present physics, 400 lend; (d) Contractor Hill (should, 405 lend; (d) 640 00 (should, 405 lend; (d) Colors Col. Much pill the hills shown in 18 lend part and on or had visible that. The other new there had never had neve

the life high of the very end mustable and place of the region of the control of dynamics. This send to control the control the control that the control the control that th



Fig. 2,-A dike of baselt (a), which cuts volcanic clay rock; Culebra Cat, near Culabra.,

This health was bet maken here a best in the lightest first the right model from the first southern to be the second of the best and a people for medicately. The best is the second best and the people for the second from the people for the people



Fig. L.—(4) Close view of a baselt office about five fact whis, which cuts volcanie

The cell libraries a product softed adults in the elevant, in Wg. 1. The difference in the seather facilities between greated and in the librar of discontaints on shaping deeps. See 1. The difference in the library of the control of the library of the elevant of the library o



L-Blown sections of east olds of Calebra Cos, sectle edge of Gold Hill



Fig. 5.-A, very remarkable fault place (c) on the west side of the Culebra Cat, just south of Las Carradas.

The semi distinctive felds must fix an distinct train or find to be just the section of year app. The relat as for that of 10 (10 only of female selection) and the property of the section of the test feet (10) of 10 or of the set. Analyze the property of 10 or of the set. Analyze the section of the test feet (10) of 10 or of the set. Analyze the consistent of these section of the section of th

### Rudolf Diesel: An Appreciation

### The Significance of a Great Inventor's Work

### By Henry Harrison Suplee

THERE are inventors and inventors!

The old-time idea of an inventor was a man who, suddenly, in some occult manner, cancelved the idea of something new wonderful, and valuable, and who then spent the rest of his life trying to get capitalists interested in it; a man who was lucky if he did not die poor and enrich others after he was gone.

The modern inventor is something quite otherwise, a trained engineer, who, perceiving the defect in some department of engineering work, directs his nind to the solution of the problem, and, bringing to it ample theoretical knowledge, carefully and accurately works out practically the application of the theory to definite success. Such modern invention is typified by the work of Rudoif Delenia.

in the summer of 1897, the Verein deutscher Ingeni-

ears was holding its convention at Casael. During the meeting the members of this important engineering soldiers of the important engineering soldiers were livited to wituses the operation of a new type of host motor, the result of the application of modern thermodynamic principles to the problem of securing maximum efficiency in the development of mechanical energy from the combustion of liquid fuel. That motor was the Diesel engine. As then shown and enthunisationally admired it was practically the earne as that which is now known all over the world as the most efficient heat motor in existence, and the greatest advance in the generation of power from heat since the invention of the sensarate condenser in Wall the

from neat since the invention of the separate condenser by Watt. Rudoif Diesel, born in Paris in 1858 of Bavarian parents, received his early education in the French capital, and thus acquired the easy fluency in the French language which made him so acceptable a speaker before the meetings of the Bociété des Ingénieurs Civils de France The outbreak of the war in 1870 rendered it necessary for his parents to leave France, and a portion of the time after this was spent in England, so that, to a thorou owledge of German and French. there was udded an equally great proficiency in English, rendering the young man a true cosmopolitan in training and thought A course in mechanical engineering at the Münich Polytechnic, under such masters as Schröter, in mechanics, and von Linde, in thermodynamics was followed by an excellent bustwas followed by an executive business training in charge of the Linde refrigerating mechine interests in Paris. Thus there were brought to the attention of this acute and broad intelligence the fundamental ms in the relations between thermal and mechanical energy in

connection with gases under high pressure. The first result of this condustation of theoretical and practical ideas to be given to the public was a small book on-titled "The Theory and Construction of a Rational Heat Motor," this appearing in 1886. Here we see the scientific man, working mentally to consider the necessary elements of a rational method for conversing heat into work. He approached the subject along the lines of this master, von Linda, considering the various cycles possible, and selecting the so-called Carnot cycle as offering the possibility theoretically considered, of attaining the maximum thermal efficiency. Having chosen the cycle, the best methods of attaining it were considered, and with these came also the knowledge of the importance of operating with a high compression ratio in connection with high efficiency.

These things determined, there followed a study of

These things determined, there followed a study of the best practical approximations which might be expected to these theoretical conditions.

We see here a complete reversal of the older ideas of inventors, of those men who, having conceived some kind of a machine, proceed to try it out experimentally, and after many failures, succeed in hitting upon something which will work, and which may, after many discentaging experiences, be developed into successful operation. The motor of Diesel, on the contrary, was first worked out wholly on paper, as a resisonal application of theoretical principles, and then and not until then, was a machine built. At this time the best thermal efficiency of the stewn agine, and that is large units, was about 15 per cent. The early Diesel engines of small size, 90 to 90 horse-power, showed immediately an efficiency, or percentage of total heat vatue in the fuel converted into power in the cylinder, in present Diesel engines in From 42 to 48 per cent, or nearly three times the efficiency of the steam engine, and double that of the ordinary gas eagine. Even when the frictional tools were the mechanism of the machine are deducted, the actual efficiency in the power available for useful work has reached about 35 per cent, and this because

Dr. Rudolf Diesel, the inventor of the Diesel engine.

of the scientific application of theoretical principles to the design of a rational heat motor.

Apart from the adoption of an efficient cycle, and the new of high compression ratios, the Disset engine has accomplished an important commercial result in two ways: the heat of the compression is sufficient to ignite the their charge directly in the cylinder, thus eliminating altogether the carbureter, that source of so many amoyances in ordinary combustion engines; while the absence of any ignifiable charge during the compression struke represents patched in monoscillos.

The intimate admixture of the pulvarized liquid fuel, into the midst of highly compressed air much above the temperature of ignition, pulses shed air much above the temperature of ignition, also insures complete combustion, even when heavy and ordinarily difficult fasile are used, so that all liquid finels may be used indifferently, from the light gasoline to the heavy distillate readions. Gas tar is readily and fully consumed, and vegetable oils, such as penunt oil or castor oil, are freshy converted into power in the Dissel engine. The revolution which such a machine is creating in the development of power must spewer. In nearly all the countries of the dyflined world the Dissel engine is being manufactured, and the leading constructors of Germany. France, Switzerland, Russels, and Swoden, as well as

England and America, are inserested in this modera power machine. It proposis practically all the effective submarine vessels in service, it is sintering into the merchant marine, and unless the ship on the water is superseded by the ship in the sir, it must enter the navel service of all progressive powers.

The contrast between this modern method of produc-

The contrast between this modern method of producing power from fuel with the older machine, the steam engine, is interesting. Instead of burning fuel inefficiently under a boiler, to convert water inselficiently into steam, convayed inefficiently through a plue, to be expanded inefficiently in a cytinder, the fuel is slujested as a spray into a mass of dense, highly heated sit, in the very cylinder where the power is to be generated. Closely crowded into contact with ample sit for its complete combustion, the fuel is completely burned to the

gaseous state, without any readuse, pushing the platon before it to make room for its increasing solume and that of the expanding air which it is beating, but without increase in pressure. Then, expanding along an adiabatic curve, it yields up energy which, in the cruder machine, was largely dissipated uselessly, and, like an expanded spring, is released.

There is probably no more laborious and exhausting work demanded of human beings than that required in the stokehold of a great steamer; and no more impressive demonstration of the result of the work of Rudolf Diesel can be given than to compare the hufernos before the furnaces of a marine boller with the cleanity, cool, and silent engine room of such a vessel as the "Salandia" with its Diesel engines.

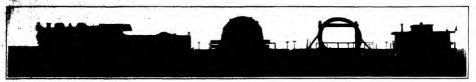
In the University of Glasgow there is chercished the model of the Newcomen engine upon which Newcomen engine upon which James Watt was working when he conceived the idea of the separate condenser. In the musuum at South Kansington there are some fragments of Stephenson's "Rocket." There is cause for gratification that in the new buildings of the great German Museum at Münich, the original Diosel engine is preserved as a monument of the result of the union of theory and practice.

#### A Hydro - seroplane Flight From Newport to New York

On September 20th William Thaw of Pittaburgh and Sinaw son Macgordon started from Newport in a Curless sping loat They port in a Curless sping loat They landed on Oakwood Heach, Raten Island, on October 6th. The most eventful portion of the trip was the journey from Morris Cove, Conn., to Statea Island. In Sping down the Beast Elver the aviators had to pass

East River the aviators had to pass under three bridges, which they did with ease. Indeed, the bridges gave them less concern than the smoke and cinders in the atmosphere of New York. This is one of the longest hydro-acreplane journeys thus far made in the United States.

An Official Register of Selected Plants will abortly be established in Hungary, if the recommendations of E. Grabner, director of the Royal Hungarian Institute of Plant Selection at Magyarovar, are sceeped by the government. The objects of this register will be, on the one hand, to protect the rights or plant-brieders and prohibit the illegal sale of varieties improved by them, and, on the other, to afford every guarantee to the purchaser of the stelst selection of the variety which has produced the seeds he whiste to buy. This guarantee will not extend to the quality of the seeds (e.g., their power of germination), nor to the value of the crops, but merely to the identity and purity of the variety. Detailed plans for this undertaking have been submitted to the Ministry of Agriculture, including provision for the Inaposition of the plants that it is desired to register, sepellocations to be employed in the records, registration fees, test sowings of the registered plants to be magile by the Institute, etc.



Special train transporting the 46-ton cover plate and 9½-ton curb plate.

### Transporting a 46-Ton Cover Plate

### A Railroad Bed Lowered to Accommodate the Castings

"I HE great aqueduct siphon which passes 1.114 foot below the Hudson Sitve is to have its shaft at the west bank closed with an enormous concrete plug, but it is essential that the shaft at the case side be provided with a removable cover so that access may be had to the tunnel when required. Those who have read the article in the SCRENTING AMERICAN Of June 24th, 1911, will recall that the aqueduct comes down to the Hudson Sitve from a considerable elevation, so that

a heavy head of water must be contended with even at the very top of the east shaft, and it has been necessary to design a closure of this shaft which would withstand an enormous unward thrust.

stand an enormous upward thrust. The shaft is 14 feet in diameter. In the concrete lining, 48 feet below the top of the shaft, an anchor ring is embedded. This ring holds the heads of 38 anchor bolts, sech 4½ inches in diameter and 50 feet long, made of nickel-chrome steel These bolts pass through a ring at the top of the shaft known as the "curb ring," and through bolt holes in the dome-shaped cover that fits upon the curb ring. To make a perfectly tight joint between the curb ring and the cover, lead wool calking and a special rubber graker are employed.

phoyen.

The curb ring and the cover were very difficult pieces to cast and also difficult pieces to transport to the site of the shaft. The foundry work was done by the Midvale Steel Company, while the task of installing the huge steel members is in the hands of the T. A. Gillespie Company.

The total weight of the cover piece, machined, is 92,500 pounds. Its outside diameter is 17 feet, while the outside diameter of the curb ring is 17 feet 10 inches. At first it was proposed to ship these castings by team to the Delaware River and thence on barges to Storm King via the Raritan Canai, because th was considered impossible to send them by rail. However, further measurements showed that by placing the castings in well cars so that they could project be low the floor of the car to within six inches of the rall, they could be trans-ported over the Pennsylvania Railroad if taken by a round-about route. The castings had to be placed on edge because, obviously, there would not be enough lat-eral clearance along the roadbed if they were placed horizontally. The task of rting these unwieldy castings in npright position was no small one, particularly in the case of the dome-shaped cover. A frame-work was built up on the car as indicated in one of our photographs, and this was well secured with the bars, running lengthwise

and crosswine

Shirt Harding

One of our photographs shows the trait which transouted the castings from the works at Midvaie to Greenville, New Jersey. It will be seen that the castings project well above the top of the locomotive and the caboose, even though the curb ring was supported in a shanting position. At one piace, namely, at Wissahickon Arenus, Philadelphia, it was impossible to passe thick makes the property of the property of the railroad bed is fines. In order to secure the proper grade at each side of the bridge, it was necessary

the trail under a bridge, and so it was decided to lower the railword bed 18 inches. In order to secure the priper grade at each side of the bridge, it was necessary to reconstruct about 200 face of the readbook At another paper the continue to order everal bolts when painting under a bridge. The shipment was made on a fanaley, and its besk 14 hours to transport the continue fraction, vary topic-heavy and would start continuing every work, vary topic-heavy and would start continuing every once in a while. This made it necessary to stop the train frequently until the oscillation quieted down. The castings have since been shipped up the Hudson

The castings have since been shipped up the Hudson and delivered successfully to within a few feet of the position they are to occupy on the shaft.

One of our photographs shows the cover under test in the Midvale shops, and fastened down with special bolts, so that it could be subjected to a hydraulic pressure of 250 pounds per square inch, for 24 hours.

The cover plate in the shop being subjected to a pressure of 250 pounds per



How the castings were mounted on the well cars.

In order to make this test, it was necessary to construct a bottom plate for the dome, 17 feet in diameter and 12 inches thick. The casting of the cover as it came from the foundry weighed 15%,000 pounds, with eight 154-inch risers. After these had been removed, the weight was still 114,000 pounds.

### Foreign Meat Regulations Established

THE Secretary of Agriculture on October 4th published rules and regulations governing the important on of mest and inest food products to carry out the mest section of the tatiff act approved on October 3rd. The regulations provide for foreign certifications ato aste-mortem and post-mortem laspection in countries which the animals are staughtered. In addition mests will be inspected by the Department of Agriculture at ports of entry before schneiden. Attached to

the regulations is a full list of veterinary inspectors in foreign countries whose certificates are acceptable to the United States.

The regulations also place foreign means after entry into the United States on the same basis as domestic meats. Herestofore imported means have been governed entirely by the food and drugs act, and have been excluded from the establishments under the inspection of the Bureau of Animal Judustry under the mean tim-

spection act. Under the new regulations imported meats are placed under the meat inspection act after entry and thus are admitted to federally inspected establishments and are governed by the same inspection system as heretofore has surrounded interstate connectee in domestic meets. The general rule is that no meats that are diseased, contain harmful dyes, chemicals, preservatives, or other ingredients which render such meat or meat product unsound, unlicalifial, nuwholesome, or unfit for human food, will be admitted

#### Mesothorium Treatment for Cancer

THE London Times correspondent in Munich reports that all Germany is ed with the idea of procuring mesotherlum for use as a panacea for cancer This radioactive substance is obtained from the thorium waste in the manufacture of gas-mantles. For therapeutic use a tiny particle is luclosed in a silver covering pierced with minute holes; the box is placed upon the part affected with cancerous growth, and is said to slowly but surely eradicate the disease, though leading physicians are disposed to reserve judgment on the subject Meanwhile, snys the Times, there is hardly a town of Importance in the country that has not voted a large sum from the public funds for the purpose of purchasing some of the costly material, and where public funds are not forthcoming, concerts, businers, and the like are the means resorted to in order to raise money for the same bur-

### Trans-Greenland Expeditions

A PIRESS desputch of August 15th from Copenhagen reports the successful ternatation of the Jamids expedition across Greenland, under Capt. Koch. The Jarry of four, one of whom was Dr. Affred Wegener, the well-known Germain meteorologist, disembarized at Cape Bismarck, on the northeast coast of Greenland, in July 1812. Octube to the lowes of their

July, 1912. Owing to the loss of their motor-boat and an accident to Dr. Weycener their departure for the luterior was delayed until the latter part of September, when the leve of Dove Buy lecame heavy enough for siedding. They wintered in Queen Louise Land, as planned. (New Neuerrice Augusta, April 27th, 1912, p. 375, and November 201, 1912, p. 376, and the party broke camp and saired on the 750-mile journey to the west costs. After encountering sovere bilizards and killing all their ponies for food, they were rescued at Proven, near Uparturik, July 1856, News has rescently been received of a trip last year across the northernment part of the Island by Knud Ramussean and Peter Freuchen, in the course of which "Peary Channel" was proved to be non-existent; benefar Peary Landie not as Island, but part of Greenland.



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RECENTLY PATENTED INVENTIONS

Ellectrical Services.

Ellectrical Services.—H. W. Poous, 1768 N. Church St., Decatur, Sil. The investor provides an obectmal connection made up of a plug and weeket adapted for esparation, the pige being adapted to be carried by a add-iron, and the socket being adapted to convey electric current to the ping which is in alectrical connection with a heating cell carried by the from the ping which is in rid by the from the ping which is in rid by the from the ping which is in rid by the from the ping which is might be ping w

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against hreakage while lo transit, especially by
parcel post, use is made of a receptarle, such
as a box, crate or the like provided with individual cells and dettile means for yieldingly
suspending the eggs one within a cell.

#### Of General Interest.

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APPARATIS FOR COOKING MEATS—A.
B. Lennes, Lee Aspelle, and Faunciece
Rose, Weshington, D. C. Address the store,
45 Byrant St., N. W., Washington, D. C. The
primary object of this lavention is to provide
an apparatus for cooking meat in a sanitary
manner, repressity for religious, and in which
during the operation of cooking sill the judges
are retained and the fiber of the meat comserved the state of gas which takes pince after firing,
thereby securing much greater velocity to the
shot discharged.
CONCRETE RESPONDEMENT.—G. C.

of the fuse
MEASTERING SCALE.—J. A. Kincaip, 529
W De is fusers St., Santa Barbara, Cai In
the present petent the invention has for its
object the provision of a measuring casie, with
which the martings on the cross section stakes
in excevating and in embankment work may
be very readily determined.

he very readily determined.

HORRERHOE CALK AND CARRIER—P.

NUME. 1300 fed Ave., Manhattan, N. Y. N. Y.

This calk has a curved plate with terth adapted to be disposed against the inner side of a shoo, this plate having slots in which are disposed to the side of a shoo, this plate having slots in which are disposed to the side of the side o

securing der cettar is postudos. The plate with which may be secured a pad.

MEANN FOR OPERATING COCKS.

VALVES, AND THE LIKE FROM A DISTANCE.—J M. F H. Git, 26 Eue Boursault, Feria, France This investion recitate to measure for controlling from a distance by electrical and is particular varies fitted to conditiate of large cross section. This means comprises mechanism for the varies extuncible by a motor controlled from a distance by a hand starter the end of the travel for opening the variety pureaus of a maximum electrical circuit breaker, and at the end of the travel for opening the variety pureaus of a maximum electrical circuit breaker in combination of an entonated derive indication of the control of the contr

and the like.

NON-REFILLABLE BOTTLE—C. WHENNYR, 147 Harrison Ava. Brooklyn. N. N. N.
Th-bottle is simple in construction and is
arranged to allow convasient pouring of the
inguid constant of the bottle into a glass or
other maceptacle and to prevent unsuthorised
persons from rodling the bottle with sourious

persons from rodling the bottle with sourious

goods.

PRIMING COMPOSITION AND METHOD

OF PRIMING THE SAME.—M. B. Swors,
TIS Lagdon St., Alton, Ill. This invention relates to a new priming compound for mis with
explosive cartridges and the like. It has been

hitherto enspiored.

80 IND 30 X.—A. C. J. Compresse, care of M. Endride d. Co., Lée, Romeleth, Rosell The investion relates protectly to consciluous and more participatify in a discreted to occidentate the contract of the

Hardware and Toole. Saw Bishprinker—B. Maxwet. Mans-field, Obio. The inventor provides a shart seer in which the sharpening device is mount-ed as abatt for revoluble movement, and in which the sharpening device will automa-tally travel along the shaft and along the saw to spane different teeth in seconsion as the

Rachimee and Rechanded Beviews,
ALARM CLOCK.—G. J. J. GACAM, \$67 W.
25th St., Manhatta, N. Y., N. The lavestion produces an alarm clock especially designed for deef people and provided with the
namel boil that rings at the appointed messent:
and likewise with a lamp which can be caused
to light up at the same time, harvering upon
the face of a person who is deaf light enough
to wake this.

an apparatus for cooking ment in a analisty manner, repectility for subment, and in which during the operation of cooking all the juices are retained and the analists of the manner. The properties of the provide and the provide area may be shown, when the end of the provide and the provide area may be moved, when the provide and the provide area may be moved, when the provide area may be moved when the provide area may be moved, when the provide

Hallways and Their Accessories, 100 Area, New York, N. T. This inventica is not Area, New York, N. T. This inventica is not accessed to the control of the control in Letters Patent No. 985,250, granted to Mr. (ripper, and in a pending application Serial No. 681,262. Specifically stated the object is to provide a form of mounting for each plate so as the spike is being driven the pixel will be provided from a possibility of the con-tions of the control of the control so as the spike is being driven the pixel.

reaction.

RAIL CLAMP.—J. P. Randen, Rt. Paul,
Minn., and W. D. Pallens, Park Phils. Wis.
The champ is for use in consection with steam
showeds and similar machinery for maintaining the name humovable on the truck. The device is inarpeasive to manufactures, is of durable and withoutable design, and is capable of
being readily attached to or devached from
the rail.

Norn.—Copies of any of these patents will be furnished by the Scianviric Amazican for ten cents each. Please state the name of the patentse, title of the invention, and date of

We wish to call attention to the fact that we are in a position to render competent services in every branch of patent certainment work. Our staff is composed of zacchanical, olectrical and chemical experts, theroughly trained to prepare and presents all patent applications, irrespective of the compiler nature particularly trained to prepare and presents all patent applications, irrespective of the superioristic patent and trade and the competent of the superioristic patent and trade-mark applications fixed and trade-mark applications fixed in an extra five fewering to the fixed fixed in an exercise fixed patent for the fixed paten

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### Steel With a Point of Flame (Descinded from sace \$60.)

The state of the s

applicability of the apparatus to the manipulation of the oxy-acetylene jet is avident. The jet is attached to the reprong point, and carefully adjusted the proper height above the surface of the metal to be cut, and when the heat is started the movements of the tracing point und the desired path on an adjacent surface, cause the metal to be cut in ac

ordance with any prearranged plan.

It is evident that this adaptation of the antagraph enables the use of templates o be readily effected, so that any number of pieces of similar shape may be cut, while the skill required of the operator is limited to the general manipulation of the apparatus. When, as has been found advantageous in some instances, the trac ing point is fitted with a power driven wheel, the effort of the mechanic is limit-ed to the guidance of the point, and a minimum of strength is required.

It seems altogether possible that this combination of burning jet and mechanical guiding apparatus is only the begin-ning of a transformation in machining methods, which may mean a much wider replacement of the older form of cutting tool than had until recently been thought

#### How One Express Company Proposes to Compete With the Parcels Post

NEW scheme is afoot which, for the A dweller in the modern apartment house, will tend to reduce food prices and make it more convenient to obtain fresh table supplies. Strangely, this school sprang from the attempt which a large express company is making to retrench itself from the inroads in its business which the Parcels Post has made.

Before the days of the modern spart

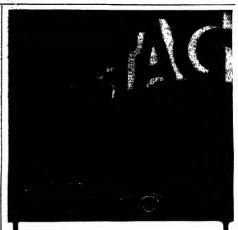
Before the days of the modern apart-ment building, people generally lived in houses with plenty of cellar and pantry room. They were able to buy the sup-plies for their tables in quantities, store them away and use them as they were needed. Buying in quantities enabled them to save on the price of many foods.

Moreover, the housewife was not forced
to pay for the same high standard in service. The up-to-date retailer must meet heavy expenses as to delivery and stor heavy expenses as to univery and so-fixtures and decorations, in order to meet competition. All of this is charged to the consumer in high prices. The problem reolves itself into answering two questions: (1) How can apartment dwellers buy in quantities, and (2) how can they eliminate from the prices they pay, the expenses of retail dealers; and, if possi-ble, of all intermediaries that stand beselves and the produ

The builders of the best apartments are adding to the accommodations every ear, and in many instances refrigerati n a central plant is already provided

If in such buildings an additional oold room in the besement were added, it a producer to deal direct with the entire building as a unit, instead of each individual family purchasing separately from etail dealers, particularly in co with their supply of fruits, vegetables butter, eggs, and other similar staples.

The express company in question is n was express company in question is now trying to assist in a more economical dis-tribution of products by bringing them directly from the farm to the table. If the cold storage room suggested above were provided, they could arrange to bring the producer and one single distributor, perhaps the superintendent of the build-ing, together, and in that way bring about direct shipment by express from the farm to the apartment building. The result should be a continuous supply of absoshould be a continuous supply of abou-listly fresh produce delivered within a down indexe after being gathered in the feel, and at lower prices than it is now possible to secure them through the exist-ing compliance and expensive crustes of injustmentom. The breefit should be a



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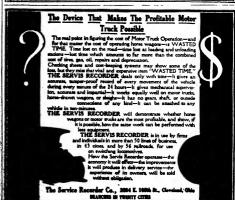
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### Hupmobile

TWO or three weeks ago Hupmobile dealers from all parts of America and Europ
as well came together in convention at the factory to see this new car. And one ma
swept the convention by saying what everyone else had thought but had not said. For ten minutes he had been telling of the hold of the Hupmobile on his big Western territory; and the crowd went wild when he suddenly drawled, by way of climax:—

Boys—when yuh talk to me about competition—1—don't—know—what-mean. I never met up with it!"

And do you know, my dear sir—you who are thinking of buying a car—that this dealer merely expressed a condition that exists everywhere.

Stop and think-have you ever heard any but kind words of the Hupmobile?

Isn't it always spoken of separately-by itself?

lan't it always singled out, and not grouped, as other cars are grouped together in a low priced class?

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### Why This 1914 Car is Unique and Alone

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The Hupmobile is in a class by itself because it has an individual, distinctive design.

is nas a present steel ruiman body.

The Hupmoble is na class by itself because its is the hignest user of situations of any moderate priced car.

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### Hupp Motor Car Company, 1233 Milwaukee Avenue, Detroit

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consumer, after allowing the superintend-eut of the apartment building a reason-able profit for handling such goods as it might be found to be advantageous to dis-tribute through this medium.

In this way the best farm products at rices below those of any retail store could be placed at the constant conveni

#### Important Progress in Airships By C. Dienstbach

THE new Zeppelin which made its first trial trip September 6th, differs so essentially from the many new craft of this type recently turned out at Friedrichs hafen, that it marks a new epoch in aero nautics. The big dockyard was length ened to build it, and an entirely new as-sembling shed is being planned for its successors. This new vessel is the "L. II.,"
the second airship for the German navy, and the changes are the outcome of the experiences in trying to make this type "weatherworthy" as the battleship whose consort it will be is seaworthy. There is every indication that the naval Zeppelin become a kind of aerial "dest

In the "I. II." the displacement has been raised to 27 tons (29,837 cubic vards). The vessel has a length of 487 et and beam of 50 feet. The dimens of existing sheds more easily permitted increase in beam than in length. To pre-serve the same strength and lightness at larger dimensions, the weight has been more evenly distributed by the addition of a third car in front of the two cars fore and aft. This new car is used only for navigating, a regular "bridge" with ouse, chartroom and all other paraphernalia. The passageway is in the in terior of the hull, and the cars are closer to the hull—to save shedspace. The old front car has been turned into an ordinary engine room, identical with the rear car, and it now also contains two motors

Hence, the "L. 11." is driven by four separate engines in two separate engine Without being heavier than the former type, the new Maybach motor de velops a maximum of 225 horse-power in place of the former 145, giving a total of 100 horse-power for the new ship. It is claimed by the builders that this new type is the first which might cross the ocean from Europe to America without undue risk

The first trial trip, lasting half an l was entirely satisfactory.

### The Current Supplement

A N article by J W. Fewkes on the geographical and historical significance of stone monuments is full of mos interesting information.-H. Brot contribhydrogen from water gas by liquefaction. In this process the lowest temperature ever employed on an industrial scale is attained -205 deg. Cent. below the freezing point of water.-J. T. Morris reports on an investigation of the wind-pressure near a cylindrical rod. A very neat electrical method of measurement is employed in this research.—W. W. Peters writes on in this research.—W. W. Peters writes on the development and present and future importance of the port of Galveston.—B. H. Bradbury contributes an article on cololds and crystals-two worlds of matter.

Bathing Suit Improvement Needed.— Now that the subject of bathing suits is attracting considerable attention it seems well to refer to and suggest a remedy for a difficulty attending the use of the ordi a dimonity attending the use of the ordi-nary equipment. A jersey suit when wet is hard to get off. Why cannot it be provided with suitable fastenings, say the glove fastener snap variety, so arranged mand with field itsel is Sherard.

Its Sherard tch, or rust.

Id Catalag.

MARK MFG. CO.

1983 Dempater St., Evantum, II.

1983 Dempater St., Evantum, III.

mere demahle.

### My Hobby

Harm's the ownesses smeaks that I ever discovered, and I've smoked for 40 years, so for the foot of th

### Five Cigars Free

J. ROGERS WARNER reed Bide. B



Ralkan — Spanish heryed or any color in spanish heryed cyricote or Disk Certifications Method hence. Write for PHEE healter less EAN payments for LA NOUA GEE 1551 HOUNG AND HOU

Shirley President Suspenders 50. So sur, "Bliffey President" is on banks. The G. A. Bilgarian Rip. Co., Saletay, Har

Leave you free in

### Practical Books for Boys HARPER'S AIRCRAFT

BOOK By ALPHEUS HYATT VERMILL EXPLANS is a simple, lacid manner, the principles and mechanisms involved in human flight, and tells how to design and construct model seroplanes, gliders and mancarrige machines. The sub-rie's purpose has been to furnish a book to six-craft not only accurate, but simple, more comprehensive and up to date then suprising yet with the contract of the comprehensive and up to date them surplining yet with the comprehensive and to be the comprehensive and to be the comprehensive and reads, the experiences of noted writtens and builders.

### HARPER'S WIRELESS BOOK By ALPHEUS HYATT YER

IN this back for younger random to author empirical simply the principles, operation, and the controlled on wiseless transmission, which controlled not wiseless transmission, partial property what to do and how to do it is to be an expected to the controlled on th

### HARPER'S BEGINNING ELECTRICITY BON CAMERON MARKET

THIS back is an introduction to electricity.

cavoidly plasmed to oveid the difficulties on often one with its collection of the collectio

The Nitrogen-filled Lamp The Nitrogene-Sided Leany The Nitrogene-Sided Leany The Temporary to the American Company of the Management of the Manag making the filaments as well as in the methods of exhausting the lamps were

even in the nope that some night lead to an improvement in the life of the lamps. Anything which would accomplish this result would render it possible to do the more desirable thing, namely, to increase the efficiency without sacrificing the life.

enting on the discouraging resuits of this empirical work, the General Electric Review states that "It was possible to improve the lamps from 10 to 20 per cent in life by certain means, but this corresponded to possible improvement in the efficiency of only a few hundredths of a watt per candle."

It was known, however, that tungsten

lamps could be run at an efficiency as high as 0.20 watt per candle for a few seconds. The melting point of the filament prevented any further increase of the effiat 0.5 watt per candle the buils blackened hadiy within a couple of hours. The blackening of the bulb was thus the chief cause which prevented the running of tungsten lamps at very high efficiencies. Continuing, the G moral Electric Re-

Continuing, the General Electric Recition tative;

"There were the most diverse opinions store;

"There were the most diverse opinions store;

"There were most the most diverse opinions store that the life might be a sealy improved if a perfect vasuance of the property of the property

The action of water vapor was, there the water value attacked the filament producing a volatile oxide of tungeten and atomic hydrogen. The oxide that thus collected on the bulb was then reduced by the atomic hydrogen. The deposit was thus changed to a black layer of metallic tungsten while the hydrogen consisted with the oxygen to form water which again acted on the filament. The action of water vaner was thus a cyclic process by which large amounts of tungst be carried from the filament to the bulb

by very small quantities of water.

Efforts were then made to study the relation between the amount of water vapor on the bulb and the rate of blackening by this cause. Pressures of water vapor even as low as 0.0001 millimeter were aven as low as 0.0001 inillimeter were large and the series attest lighting on from 6 fp positione very rapid blackspring. As an apresent of a classic of a variety of the removal of water vapor, it was of high proven that the blackspring of bulks with color is respect to the removal of water vapor, it was of high proven that the blackspring of bulks with color is respect to the province of the series of t

probably due to ordinary evapora

probably due to ordinary evaporation.

"To set this theory, quantitative appearance have been made to determine the safe of loss of wight of tongene filaments in recouns when run at various temperatures. This work has conclusively above that the cause of the blackening of ordinary well-made than their rated efficiency; is supple wapparation. On the other hand, the rapid blackening of poorly made lamps is doe largely to the presence of water vapor.

The blackening of the largely made and the vaporation, the problem of improving the efficiency assumed more desilter form. To large the state of vaporations would have to be decreased or the evaporation will be a supplementation to the evaporation of the

larly interesting:
"1. Introduction of gases, such as nitrogen

"I. Introduction of gases, such as nitrogen er mercury vapor at atmospheric pressures into the isamp bulb.
"S. Changing the location of the deposit by means of convection corrents in gases, so that the control of the

The question arises: Are the advan-tages to be gained by the use of a gas sufficient to offset the tendency for an increase in the rate of evaporation owing to the higher operating temperature?

This the General Electric Review awers thus:

This the General Electric Review anawers thus:

"Simultaneously, with a large part of the
perceding work, several investigations on the
flast losses of wirse in various gases had been
under way. It had hour found that the best
lost by convertion increases only slevely petiction to provide the several petiction to the several peticinstitute of the several peticinstitute properties. It was the several
percent the temperature. At verification to
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From the foregoing considerations it is clear that the larger the diameter of the helix the higher the efficiency that may be obtained. The diameter of the helix is ordinarily limited by the sagging which is apt to occur if the mandrel or which the helix is wound is too large in proportion to the size of the wire.

With helically wound filements in nitro gen very high efficiencies can be obtained and yet the life of the flament may be and yet the life of the nament may be more than 1,000 hours. The blackening of the builb is avoided; and in properly designed buils the tungsten that evapor-ates produces only a slight brownish deposit in the upper part of the bulb, where it does no harm. A number of types of nitrogen-filled lamps have been made tested. Among these the most intere for the present are perhaps the following

"1. Large units of very high efficiency. (0,4-0.5 watt per candle with a life of 1,000 hours or more.) These take currents of at least 30-30 amperes and (except to units over 4,000 candle-power) are therefore best run from alternating current circuits by means of

from alternating currout circuits by means an annual transformers giving a rottage depting on the size of unit desired.

"3. Smaller ments of low cellage. "The currouts of the annures or less, at vage, in some cases, as low as four or, wets. The efficiencies with 1,000 hours with 1,000 hours are shaped for the currout used. The impa are adapted for series street lighting are adapted for series street lighting decreases an order of the currout of the cu



### How Much Do You Know About the Springs that are Under Your Car?

Do You Specify the Springs As Carefully As You Select The Tires, The Axles, The Magneto?

Perhaps you have never fully realised that it is not so much cushions, one with some month-rolling wheels, under your car, as it is springer. That it is the springer, far more than lies or bearings, that sheld the motor mechanism from road joils and jars—that case a car over the bumps and themps of bad going; thus saving depreciations and repairs.

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mailtee units the self-cleary is wramana, as held.

"decided their high self-cleary, these are certain features of the self-cleary, there are certain features of the self-clear which merp preve of advantage for certain cases.

"I. Offer of the hight. The hospectarities of higher than that of confeatur, tumpates hanged, causes the hight to be of a very much writtee color, so that it comes cleare to daylight than any other form of artificial limitations except the direct current are and the spotial bloove and other control of the confeature of the

almost exactly like that which can be obtained for a few minutes by rimining an ordinary tungsten lamp at double its rated voltage. "By the use of special color setrems it is possible to obtain a true daylight color at an efficiency of about 2 watts per caudle where as with ordinary tungsten lamps the efficiency

self-enery of about 2 waters per caudie where-as with ordinary tungeten lamps the efficiency obtained with the proper across is only 10-12 waters per caudie. When the proper across is only 10-12 waters per caudie of the proper across is only 10-12 water per caudie of the proper caudie of the proper caudie of the properties work such as headilghties and carrospitons. Although the histhane four projection work such as headilghties deterophical. Although the histhane deliberation of the result of the properties of the across the properties of t

### A Scotch Manufacturers' View of American Industrial Conditions

IN the Western Supplement and Advertiser of the Scotsman for August 16th appears a letter from Mr. John Muir. eather manufacturer of Helth, in which he presents a very interesting picture of American industrial conditions as he found them during a recent visit to the Hultad States "In the vast corn belt where the chi

product costs about 25 cents a bushel to the farmers," says Mr. Muir, "they have had an unlimited market at over 50 cents, and are now realising up to \$1 a bushe for it in the form of hogs, owing to the high price of bacon.

"With the scope there in developing a new country and with well-remunerated effort, population has naturally increased till that of the United States to-day is ble that of Great Britain.

"Manufacturing enterprise has been stimulated by this agricultural and get eral prosperity till the exports of the United States have for the first time exceeded those of Great Britain this year.

"The Americans are a nation of chanics organised by men who know hos enamics organised by men was know now to get and how to keep business. Backed up by nature as their powerful ally and an ever-expanding home market, they are able and willing to now rapidly capture export trade. They turn out 65 to 70 pe

cent of the world's motor cars already.

"In Canada where a preference duty of
60 per cent is given to British makers, the Americans have already capture the Americans nave aireacy captured that market. A British car is rarely to be met with. Yankee enterprise is thus circling the globe, and it looks to me as if they intended that we should be left only with a congenial atmosphere in which to congregate around the parish pump to 'wait and see' them in full posusion of the export trade in that is

Some New Peter Cooper Hawlit Patenta.

-Peter Cooper Hewlit of New York has soured patent No. 1,089,695 for vapor electric apparatus and No. 1,069,096 for a starting device for vapor apparatus. The former provides a plurality of negative The former provides a phreakity of negative electrodes and a common positive electrode in connection with a separate work elecutic composted with each negative electrode, while the latter provides in sensention with other parts electrical devices by which other parts electrical devices by which on the extinguishment of one or two vapor devices, a starting viscoust will be developed for initiating the flow of



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### THE WEEKLY JOURNAL OF PRACTICAL INFORMATION

ABLEME CAK )

NEW YORK, OCTOBER 25, 1913

PRICE 10 CENTS



Prevost rounding a pylon

### The Race for the Gordon Bennett Cup By John Jay Ide, Special Aeronautic Corresp of the Scientific American

If Is eight clock in the morning at the Gare de l'Est,
Paris, on Monday, September 29th. An enormous
crowd is rushing for the train to coursy them to Rheims
in time to assist at the race for the Gordon Bennett
Cap. The railway carriages are completely filled by
standees who endure the two hours journey without a
murnaur. At Rheims we make a dash for the train
marked "Hacrdorme." It pulls out after shout a dosen
if us have clambered aboard, leaving the rest of the
trainful on the Butstrom. trainful on the platform.

As we approach the flying ground we see young Crom-bes, the Belgian representative who had drawn the first departure, circling the course. He started at ten o'clock. Although his Deperdusain is equipped with a 100 horse-power Gnome, he is not a likely

winner as he plays very safe at the cor-ners. His time for the 200 kilometers (124 miles) is announced as 1 hour 0 min-utes 52 seconds, whereat the Frenchmen feel perfectly safe.

Early this morning, several hours before our arrival, Emile Védrines made a trial circuit with his 160 horse-power Ponnier. inutes 58 seconds, which is over seconds better than Prevost's time eleven soconds botter than Prevoté's time in the eliminatories. On bearing this the Deperdussin manager became desperate and sent to the factory for new wings for Prevoté's mount. These wings, which would support the machine only in ideal weather, such as we are having to day, are almost perfectly flat on the under-side and have a span of less than twenty

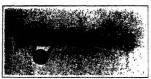
soon for Prevent to start at 11:15. The

soon for Prevont to start at 11:15. The powerful Galome syntage, into action at the very first averag of the tractor and Prevont deaders are to treat the stage when until he speeds up to eightly makes an hour. The flight as seen from the inning prior is impressed up the startess. He files very low, about strip foot above the ground, but before reaching the pytion he rises to \$5 test, buthat steeply, and, dives around the corner, fairly sharing the pytion. When the times amounted that Preventh has completed 100 kiloseters in 29 minutes 40 seconds, girling a speed four few 200 kiloseters now hear, we get greatly and kinometers in 29 minutes 60 seconds, giring a speed of jout few? 50 kilosusters per heart, we get greatly excited shal speculate as to whather the 500 kilosusters will be secondarised within the feser. As the two-risks lags, is completed our hopes two resident, as the risks lags, is completed our hopes two resident, as the risks in a secondarised our hopes two resident, as the single of 100 kilosusters per hour (126,5 miles per limited at 350,608 kilosusters per hour (126,5 miles per

at's return to the hangure he is given a royal 



The 160 horse-power Ponnier driven by Védrines



Prevost, the winner, in flight.

A shout goes up for Bechereau, the brilliant and successful designer of the wonderful and justly celebrated Deperdussin monoplane. Meanwhile Cilbert starts in a Deperdussin, but with a greater wing spread and another make of motor- i.e Rhône. This ngine has all valves mechanically operated and uses oline than the Grôme, though of the same horse power (160) Owing to the greater prestige of the production of the Brothers Seguin, Le Rhône is very seldom chosen by pilots. Gilbert takes over three minutes for his first round, so is seen to have no chance to wrest the cup from Prevost. The crowd adjourns to

wreet the cup from revous. The crown unjoins to the restaurant, which does a roaring business serving a very poor lunch at ten francs a plate. On Gilbert completing the 200 kilometers Emile Voltnies starts on the all but hopeless task of beating Prevout's time. He is three seconds per lap slower Prevost's time. He is three seconds per iap slower than Prevost. If the Ponnier pliot had started first,



A new type of Morane-Saulnier driven by Garros.

wever, he would have held the world's record if only for an hour, as he easily surpasses the times set up by Prevost on Saturday. With Védrines' descent comes to a close the last free for all Gordon Bennett Cup we

shall probably ever see.

Below are tabulated the figures relating to the cup:

Non World's Speed Records.
, Pilot Alone.

	0 kilometers							
2	0 kilometers	•	12.4	miles).	18	minutes	54 1/5	seconds.
8	0 kilometers	Ċ	18.6	miles).		minutes	82 1/5	seconds
	G kilometers	ŧ	14.8	miles).	11	minutes	80 1/8	seconds
2	O kilometers	i	81 .	inties).	14	minutes	48 1/5	anconds
10	o kilometers	ì	62	miles).	29	minutes	40	seconds
	O kilometers			miles).	44	minutes	38	seconds.
20	O kilometers	Ċ	124	miles).	-	minutes	45 8/5	seconds.



The nose of Prevost's machine.

Gordon Bennett Cup. 1915

- 200 kilometers (124 miles)
- 200 Allometers (123 miles)
  Prevost (Pheprodustin-4/iden) (210 horse power) 50 min utes 45.35 seconds Average speed 200 808 klowe eters (1245 miles) per hour.

  2 Vedriess (Pontier tidana 200 hosse power) 1 hour control 1 hour control 1224 miles per hour (1224 miles 55.276 seconds Average speed 1911 klimpters (1185 miles) per hour (145 miles) (per hour (145 miles) (per hour (145 miles) (per hour (147 klimpters) (145 miles) (per hour (147 klimpters) (pe

### Enforcing the Migratory Bird Regulations

FOLLOWING the proclamation of the President of the United States establishing regulations for the protection of migratory birds, the Department of Agri-culture has set in motion machinery to make these regu-

lations effective in every State on No nations effective in every state on No-vember 1st, the date set for the op-eration of the proclamation. These regulations put under Federal protection, for the first lime, a large number of migratory game and inscetivorous hirds and time place Federal restrictions on the five million hunters of the United Stafes, in enforcing these regulations Federal authorities will co-operate with State game commissioners and other State authorities in carrying out the provisions of the law and to prevent complications in the local enforcement of the regulations

Among the hirds protected by the regulations are the brant, wild duck, goose, swan, cranes of various species, rail sev-eral kinds of shore birds, pigeon, dove. wild pigeon, bobolink, cathird, chickadee, cuckoo, flicker, flycatcher, grosbeak, humming bird, kinglet, martin, mendow lark night hawk, nuthatch, orlole, roble sbrike. swallow, swift, thrush, warbler, whip-

poorwill, woodpecker, and wren.

Curious Self-Starting Accidents. - Of late examples are been seen of a disconcerting class of automobile cident which consists in the self-starting of the motor The most recent one of the kind occurred upon the route from Chemnitz to Buchholz, near Berlin. An autobus fell over an embankment and 27 persons were wounded motor had suddenly stopped when on the and the driver descended in order to start it up. Moan-while the motor started again and the autobus ran over the bank and fell for six feet. An accident of the same kind happened in Paris, where the automobile had been left for a short time with two children in it The motor started up and the automobile ran into the Seine, where it was entirely submerged, vith resulting loss of life.

### SCIENTIFIC AMERICAN

NEW YORK, SATURDAY, OCTOBER 25, 1913 Published by Munn & Co., Incorporated Charles Allen Munn, Preside Frederick Converse Beach, Searstary and Treasurer all at 50 Broadway, Rew York

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The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If this pictographs are emily, the articles wind, and the facts outhenter, the contributions will receive special attention. Accepted articles will be paid for alregular space rates.

The purpose of this journal is to record accurately, simply, and interestingly, the world's progress in scientife knowledge and industrial achievement.

### The Peril of Fire at Sea

THE two principal risks to which these who travel by sen are exposed are foundering and "Titanic" proved that, even in these days of tighty developed ship construction, the first of these risks was ever present and might be attended with appaling con-sequences. To-day the burning of the "Volturno" re--an ever-present menace in ocean miuds us that fire travel-may occur at any moment, and may be attended

with enormous loss of life
The lesson of the "Titanic" disaster has been laid well to heart; and it is realized that, as far as is me chanically possible, every ship should be made its own lifeboat and should be built with such complete subdivision that its foundering at sea will be a very remote contingency. The lifeboat of the future must be a larger and more seaworthy cruft, propelled by motors and comble of reaching the nearest rescuing steamship

But now comes the tragedy of the "Volturno" with its imperative demand that a searching investigation is made of the question of fire prevention and control on ships at sea. At the time of the loss of the "Titunic," says at sec. At the time of the loss of the Thanks, the Schwitzer Amsara wired that in the investigation of the question of safety at sea, the subject of fire risk should be given full condeteration. This winter there will be held in London a great international gathering of experts to determine the best methods to prevent the repetition of such a disaster as happene to the "Titunic," and the burning of the "Voiturno emphasizes the necessity for giving the deliberations of that gathering the broadest possible scope by including the subject of fire protection.

carefully compiled governmental statistics of such fires, great and little, as occur on ships at sea were periodically published, the public would be amazed to learn how many and how serious the fires are. The passenger steamship companies are well aware of the imminence and seriousness of this risk, and the speed with which such fires as do occur in the pass odations of ocean liners are detected and puout, reflects great credit upon the watchfulness and efficiency of the officers and crews. It should never be forgotten that the long reach of passenger accommodations, piled up as they are, deck above deck, and tilled with highly inflammable materials, calls for special provision against sorend of fire in the way of steel hulkhends, carried clear across the ship from side to side and extending to the topmost deck. These fire bulkheads should be provided with effective fire doors wherever they are intersected by the alleyways, and fire drills, with every member of the crew at his station, should be regularly carried out. Each fire compartment as thus divided off should be provided with its wa independent fire hose connections, and these be numerous, well distributed and of large capacity.

It is not the small first in the passenger accommoda-tions, however, which grow to serious proportions; the fires that endanger the ship, such as this that broke out on the "Voltarno," originate below deck, and asnaily in the hold or in the coal bunkers. Such fires as the recent outbreak on the "Imperator" are difficult to get at, and exceedingly difficult to put out. A coal bunker fire is proverbially stubborn and persistent, and an officer of the Navy has recently told us that in this service, even the long-continued filling of an entirely closed bunker compartment with steam has more than once failed to subdue a fire therein. A fire in the hold of the ship, particularly if it is flied, as in the case of the "Volturno," with highly combustible material, pre-sents an even more puzzling problem; for it is more difficult to exclude the air from a hold than from a

Why is it that the automatic sprinkler, which h proved so highly efficient ashore, has not been applied to the protection of ships? Structurally considered, the m should not be a difficult one, since the sys might be pisced inconspicuously in the cabins, alley might be piaced mensiprousny in the cause, and, ways, and sations, and the piping, fraes, etc., being overhead, would not interfere with the loading and un-loading of the various holds. An abundance of water supply under high pressure is always available aboard a stoumship, and the piping could be made of such generous capacity, that the putting out of an incipient blaze, even in a hold stored with inflammable material, may be rendered a practical certainty.

Two conspicuous lessons are that wireless has again

established its priceless value as a means of saving life at sea, and that the present lifeboat must be abanlife at see, and that the present increase must be assu-dened and a new type of large, seaworth, power-pro-pelled boat must be substituted in its place, and pro-vided with inunching mechanism powerful enough so-of sufficiently wide reach to place these larger lifeboats ea, well away from the ship, and clear of any risk of being wrecked by collision with the same "Grosser Kurfuerst" seems to have used a power boat which did noble service in a sea in which oar-propelled lifeboats were comparatively powerless

#### To Beautify the Panama Canal

HE National Commission of Fine Arts, through its chairman, Daniel C. Freuch, has placed before the Government its views on the question of beautifying the Panama Caual. Congress in August, 1912, authorized the Commission to report its recommendations regarding the artistic character of the struc tures of the cannil, etc., and into this question the Commission has entered very thoroughly and with con-clusions which reveal a correct judgment of the situa-

"The canal," says Mr. French, "like the Pyramids, or some imposing object in natural scenery, is impress from its scale and simplicity and directness. One fe that anything done merely for the purpose of beautifying it would not only fall to accomplish that purpose, but would be an impertinence"

earing in mind the character of the Comm may be said that the above conclusion was inevitable, for it is certain that even the cansal visitor to the canal, if he be possessed of any artistic sense, or sense of the fitness of things, must realize that the adornment of the canal on any extensive scale is an utter impossibility. The shoreward view as one enters from the Atlantic is firt and uninteresting, and presents no natural feature which invites the erection of any ade quate monumental structure. The fine two-mile break water extending from Toro Point terminates in a light house for which the Commission has made some after native plans that have been adopted. It is proposed that if suitable foundations can be developed, a monu nental lighthouse should be built where channel through the lay commences, or else that a lighthouse be located near the position marked by beacon lights 1 and 2 1f this is impracticable, it is recommended that a lighthouse or some form of mo ment be constructed on the first high solid ground countered in entering the canal from the Atlantic, say at the Mindi Hills where the Gatun locks first attract attention. Unless this structure be built on a scale commensurate with the magnitude of the canal, we think it had better be omitted altogether.

Although the Commission felt that it was desirable to mark the entrance to the caual from the Pacific in a manner similar to that proposed for the Atlantic end was found that the conditions were not favorable to It was found that the conditions were not already as such a structure, and it considers that nature has pro-vided in the shore line itself, with its rugged range of mountains, and in the interesting islands guarding the cutrance, an approach which is sufficiently im

The most practical suggestion, one which we believe will meet with general approval, is that for the construction of a vast memorial tablet in the Culebra cut. It is proposed to form an impressive inscription upon onumental surface at some point of promia great monumental surface at some point of promi-nence, and preferably on the east wall of the cut at the point of the deepest cut—482 feet—where the canal passes through the Continental Divide. The Commissuggests that the tablet should be approximately 100 feet in height, and somewhat more in width; that it should be severely simple in design, and that the lettering should be done in Romau V-shaped letters, large enough to be easily read by normal eyes from the opposite side of the ennal. It is proposed that the material shall be concrete and applied as a mas facing to the trap rock of the cliff.

Now here is a suggestion W altogether appropriate; and we trust that who subject matter of the inscription comes to be deupon, care will be taken to make record of the that the successful carrying through af the great d of the fac was due to five years of continuous supervision by that capable and faithful officer, Col. D. D. Galliard, whose health was disastrously wrecked on the ere of the completion of the work.

#### What Have the Russians Discovered in the Arctic?

PRESS dispatch from St. Michael, Alaska, dated October 11th, announced the arrival at that port of the Russian government vessels "Taiand "Waigatch," just back from a summer cruise in the Arctic, in the course of which had been discovered a hitherto unknown land, vaguely described as "extending beyond latitude 81 north and longitude 108 st," and said to be "as large as Greenland." west, and said to be "as arge as Greenland." This information was somewhat modified in subsequent dis-patches. The newspaper accounts of the discovery, however, up to this writing, have persistently distorted its true character and importance, and it, theref

its true character and importance, and it, therefore, seems destrible to attempt a reconstruction of the story in the light of known facts.

The vessels in question, which are ice-breakers, were first assigned to Arctic work in the summer of 1911, when they were sent by the Russian government to execut the expedition of Admiral Trajan, on the "Kolyma," to the Arctic coast of Siberia tols Bering Strait, the week true head by the Processible (8c.) No. 1852/class." ma," to the Arcite const of neighbor between the many proceeding without them. The following summer they made another attempt, entered the Arcite Ocean, carried out important explorations and surveys as far west as the mouth of the Lens, and made an unsuccessful effort the mouth of the Lena, and made an unsuccessful enor-to pass the Talmyr Peninsula, in order to complete the Northeast Passage to Europe. Early last July they sailed from Vladivostok on the voyage which they have just completed. The last expedition was commanded by Major General Sergejcv, but he was forced by illness to leave the party in Bering Sea, and returned south on a Russian cruiser, leaving the com-mand to Lieut. Wilkitzky. When last previously heard from the ice-breakers were off the northern Siberian coast and were understood to be making another at-tempt to pass the Taimyr Peninsula. It was not anticiputed that they would try to reach the high latitudes which they appear to have attained.

According to later and more circumstantial reports the explorers were endeavoring to reach the n the Yenisel, but on account of ice along the coast the Yenisci, but on account or ice along the coast, turned north, and thus stimulated upon the new land, which they encountered about 00 miles north of Cape Chelyuskin. They cruised northwesterly along the mar-gin of the land to intitude 81, longitude 90, where a solid pack prevented further progress, though the land could still be seen extending to the northwest. In the opposite direction the const-line was followed to longi-tude 104, intitude 79, where it turns to the northeast. The land is mountainous, and gives evidence of recent The iand is mountanous, and gives evidence of recent volcanic activity. The explorers landed, raised the Russian flag, and took possession in the name of the Czar, maming the land "Nicholas Ii. Land." In all, about 200 miles of const-line appears to have been actually seen by the explorers—a very far cry indeed from the "Arctic continent" or "land as large as Greenland," of which the newspapers have been tell-

Reference to any one of the numerous mans of the Arctic regions on which is shown the route over which Nansen drifted in the "Fram," in 1803-96, will furnish convincing evidence that the newly discovered land must be of very small extent as compared with a conti-When the first report of the discovery was received it seemed possible that the longitude had been incorrectly reported, or that the explorers had reckened their longitude from Pulkova instead of Greenwic In either case the new coast might have been the border of a land mass of great extent, occupying the site of the hypothetical continent or archipelago required, ac-cording to Dr. R. A. Harris, to explain the Arctic tides, i. a., the terra iscoputa which the Crocker Land expedition is now seeking to attain from the south-east and the Canadian Arctic expedition from the south. This supposition was, however, dispelled by the definite atatement, in a later report, that the new land begins 60 miles north of Cape Cheiyuskin. It must therefore lie between the route of the "Fram" and the Siberian coast. Moreover, as Nansen obtained soundings of from 10,000 to 11,000 feet only two or three degrees north of the Russian discoveries, and found no evidence of land in that vicinity, Nicholas II. tound no evidence of land in that vicinity, Nicholas II. Land can hardly extend very far north of where it was estually seen by its discoverers, and can have no physical consection with, the extensive lands which, many geographers bolieve to exist north of Ataska, red, easternators (Bheria. The propositive lauren of fice-fanon, or MacMillan, or Amundeson—as the case may: be-are still safe.

#### Engineering

mittels Dreadmought fitrength.—According to the Blads and Milliany Record, by March 31st of next gair Greek Britain will have in commission 32 dreadwards and Germany will have 15. The Record notes the fact that for a short time at least, Greak Britain will have reached its desired standard of two ships to one in battleships of the dreadmought type.

The Jura Tunnel Commission.—

one in battleships of the dreadnought type.

The Jura Tunnel Completed.—The boring of the
Mont d'Or tunnel between Prance and Switserian,
which was commenced about three years ago, was
completed on October 10th, when the two gauge which
all been working from the Swits and the Preson is dies
met. The tunnel which is 3 3-4 miles in length pierce
the Jura mountains from Present to Vallorba, saving
thoreby a seven-mile detour by Pontarlier. The line
will be open for traffic early in 1914.

will be open for traffic early in 1914.

New Material for Automobile Reads.—Experimental tests giving satisfactory results have been made in France with a new road-surfacing material, which has been devised specially for automobile traffic. It consists of a mixture of what is called "iron straw," which consists of fine filaments of iron in a wiry or fibrous mass mixed with cement and easd. It is stated that the fron is not a waste product, but it is made by machines designed for the purpose.

A Boy-Secut Cantilever Bridge.—An effective cantilever bridge built by boy-scouts is illustrated in Engineering News. The bridge was built after a sixted made by Prof. D. B. Steinman of the University of Idaho. A24-foot suspended span consisting of two 6-lank logs passes into grooves beveled at the ends of the 8-lank logs forming the eastliever seria, the latter being kuried under a rock fill, in inclined hoise dug in the banks of the river. The roadway consists of cross logs held in place by longitudinal stringers.

place by longitudinal stringers.

Cost of the Panama Casal.—Up to date the Panama

Canal has cost \$314,370,978. The total cost when comploted will be within the criginal estimate of \$375,000,000.

Engineering has cost \$185,316,095, and of this nearity
\$44,000,000 has been spent on the Culebra cut. Sanita
tion—a fundamental necessity if the canal was ever to
be built—has cost \$16,250,104. The sale of old material,
the work done for outside companies, and water rentals

from Panama have yielded the United States about

A Difficult Bridge Problem.—The city of Caigary, Alberta, has recently solved a problem of bridge construction in a novel manner. The town lies on each side of the Bow River, that portion on the north bank being built on the high blidfe which border the river on an incline to the top of the blidf would have been to neglect the portion of the city lying at the foot of the bluff. To make a deep cutting would have spoiled mush of the property. The problem was solved by constructing a level bridge across the river, and then gaining the heights above by an inclined tunnel bored through the ciliffs.

British Fire-Director Gunney Record.—The British batteship 'Centurion' has made & fan record in its gunlayers, which may be compared with that of the windown of the property is correct, this is a very small target for the property is correct, this is a very small target for the property is correct, this is a very small target for the property of th

The Straits of Panama—The chief engineer of the Panama Canal Company when the work was in French hands, Philippe Bunau-Varilla, in a dispatch from Colon, states that the completion of the look casal mark the beginning of its transformation into a free strait at sea level. Varilla has always favored the construction of a sea-level conal by the hydratillo method. He proposed commencing at a summit level fed with water from the Chagres, and using hydraudic dredges, successive longer reaches enclosed by end dykes being filled with water as the depth of the out increased. The achence was not considered to be practicable by the lathwine Canal Commission.

The Canal, the Merchant Markes and the Navy—
that the American-Hawalian Lies has built and is
building night new vossio of all and seven thousand
building sight new vossio of all and seven thousand
tons for service through the Panama Canal, which will
bring the number or playe
age of 29, the number of playe
ton the seven through the Panama Canal, which will
be in 28, the number of playe
ton to the number of playe
ton 128, 500 to 28,000
tons to rour navy in oses of war. Other conseives
morance or sent anging their flaver, and the activity has
extended to the Great Lakes shippared; the whole outcome of which, as affecting the navy, will be that not
only will a fine fleet of colliers be available, but the
said salarged fleet will provide a body of men trained to the
said and shizable for salistment.

#### Science

Professor Friedrich Peckels, the well-known German physicist and editor of the Beblatter su den Annalen der Physik, died August 29th at the age of 58.

The Next Eugenics Congress.—It has been decided that the next international Engenics Congress will be held in New York in 1915, on or about September 20th.

The Northeast Passage.—The Russian loe-breakers "Taimyr" and "Waigatch" left Vladivostok early in July on a voyage size Bering Struit to the Arctic coast of Siberia. It is proposed to renew the attempt made by the same vessels last year to round the Taimyr peninsula and pass through the Sea of Kars to Europe.

Gasemsters as Aerial Signposta.—In accordance with a resolution adopted by a gas congress recently held at Toulouse, a number of gas companies in France have agreed to paint direction and geographical signs on the roofs of their gasemeters for the guidance of ascenauts. A numerical system of signs elaborated by the National Aerial League will be adopted.

Water Fower Development in Iceland.—A consular report states that an English company has just purchased Dettifalls, the largest waterfall in Iceland, situated about 35 miles from the seacoast, on the River Tokula. The company proposes to erect large works for producing festilizer from atmospheric nitrogen and to build a railway from the coast to the falls.

Cloth from Seaweed.—The much talked of English project of utilizing the fiber of a seaweed. Posidonic neutrale, se an admixture with wool in blankets, various kinds of sloth, and for the warp of carpots, appears to have come to grief. An order in Chancery was recently made for the compulsory winding up of the company engaged in exploiting this scheme. The embarrasament of the company is, however, reported to have been due to causes not militating against the feasibility of the process in question.

Use of the Camera for Judging Races.—An automatic photographic apparatus for judging races proved successful in Prance and will be used at the next Paris international race meeting. A camera is placed in line with the winning post, and the winning horse, by breaking a thread, releases the electrically controlled shutter and a photograph of the finish is taken A similar device was used at the last Olympic Games at Stochholm, but there the photographs were chefly used as additional evidence in case of a disagreement between the judges.

Vacant Let Gardens in our large cities represent a form of practical philanthropy that is attracting favorable attention throughout the country. In Philadelphia, according to the last annual report of the Philadelphia, according to the last annual report of the Philadelphia, according to the last annual report of the Philadelphia Vacant Lofs Cultivation Association, the land is lent free of charge by the owners. The association spends about \$45 a garden for plowing, fertilizer, sood, etc. Each garden is assigned to a family, which pays \$1 the rise cases, \$2 the second, and so on, until the fifth season, when about the full cost is collected. In 1912 42 families were assigned gardens, averaging about one sixth of an acre. The families spread the fertilizer, and plant, cultivate and harvest the crops, supplying their own tables and selling any surplus.

Interesting Work for Telescopists.—The American Association of Variable Star Observes has just completed its second year's work with a total of 12,900 observations to its credit as compared with 6,180 observations contributed last year. The association has a membership of twenty observers, and in under the direction of Prof. B. C. Prekering, Director of the Harvard College Observatory. The value of cooperative observing in this line of telescopic work has been fully demonstrated, and it is boped that more telescopies will join the ranks of the association. Here is a splendid opportunity for anyone with a telescope of three-ional sperture or larger to suggest in an interesting and practical line of solicitifies research. These interested are required to address William Tyler Olcots, Corresponding Scoretary, Nor-bib. Corus.

wich, Conn.

How the Government Tests Paper.—In the Scientific Amusican for October 4th, there appeared an article entitled "How the Government Tests Paper." Under the heading "Analyzing Londed Papers" there appeared the following statement: "The amount of sach thus obtained in really less than the sotual amount of loading or filler, which may contain water or other volatile agents that pass off in the burning." This statement requires explanation, as it takes no account of the natural sach the filters used or the saft from other raw naivestals. Except in the case of calcium sulphate fillers, the amount of water or volatile matter would not exceed five or ten per cent of the weight of the filter present. As the natural sach may be as high as 1.5 per cent of the weight of the paper, and in a sized paper is saidong, if war, less than 0.6 per cent, it is apparent that the statement given would create a false impression of unloaded or slightly loaded papers, where the sach is in excess of the amount of filter in the paper.

### Automobile

A Sectional Rim Spring Wheel.—August Gerleit of New York city has patented, No. 1,066,267, a vehicle wheel which has spring poloes and a rim composed of separate sections. The outer ends of the spokes are secured to the adjacent ends of their respectiver im sections. The connection between the spokes and the rim is a sliding one.

A Mowing Attachment for Motor Vehicles.—In patent No. 1,098,705 Otto Kluge of Golswafa, Ill, combines with an automobile flywheel a mowing device driven by a shaft operated from the flywheel of the automobile outcome, saitable controlling and supporting means being arranged in connection with the other parts of the apparatus.

Two Patents for Eye Protectora.—Gilbert D. George of St. Paul, Minn., has secured two patents Nov. 1,070,384 and 1,070,385, for eye protectors, in bolto of which two fiethle transparent shields are arranged to overlap and are pivoted together, and no ue patent the shields are concavo-convex so they may nest together when folded. When the shields are concavo-convex so they may nest together when folded. When the shields are opened out they precare of spectacles and are smillarly used

Special Roads for Automobiles—The increasing use of automobiles in Europe is leading to the construction of aspecial routes reserved occlusively for this class of traffic. One of the first of these to be built in Germany of extensive length is to run between Disseldorf and Dortmund, and it will have about 80 feet width throughout the whole length, according to the present project. As to the part of the route which traverses Westphalas, the several municipalities are now discussing the plans

Combination Lock for Sparking Circuit of Astomobile.

—Recent publications mention a combination took for
use in the sparking circuit of an automobile in which
a pushpin combination look is utilized in completing the
circuit. In 1904 Pay Leone Fauroi of Aim Arior, Mich.,
took out a patent, No. 759,000, for an apparatus, the
object of which was to provide a switch in the electric
circuit of an automobile which circuit could be completed
only by a predetermined definite arrangement of parts
not apparent to the observer. The part to be so arranged
were the elements of a combination look. Somewhat
similar devines have been provided in the patented aris
in which combination looks have been arranged in connection with the electric circuit and some of the valve,
in some instances the fuel valve of an automobile, in
such manner as simultaneously to control both the
circuit and the valve.

Usited States Leads in Motor Vehicles,—At the rocent International Road Congress ledt in London, a complete seems of the world's motor vehicles was compiled for the first time. As the United States leads in the production of sutomobiles, so she also leads in their operation. It was learned that this country possesses more than half of all the motor vehicles in their operation. It was learned that thes country possesses more than half of all the motor evels, their gibbs, is as compared with England's 125,728. The baliance of a total of 1,161,911 as distributed throughout the other countries of the world. France ranked third with 89,185, and Germany fourth with 70,003. The total number of motor trucks, included in the above figures, is given as 69,055. Usually the number of automobiles in any country greatly exceeds the number of trucks, and only 15,518 pleasure cars. It should be noted, however, that these figures are based on reports dated June 1st, 1912, and probably fall far short of the set all number of vehicles in use to-day It is estimated that there were no less than 300,000 motor vehicles must contain the torter were no less than 300,000 motor vehicles must contain the torter were no less than 500,000 motor vehicles must contain the torter were no less than 500,000 motor vehicles must contain the country of the set as the contained that there were no less than 500,000 motor vehicles must contain the country of the set as the contained that there were no less than 500,000 motor vehicles must contain the country of the set as the country of the s

A Find Steel Ring Shock Absorber.— It is estimated that unward of \$20,000,000 a year is being spent by motor truck users in this country for repairs and replacements, caused chiefly by road shocks. The permanent access of the whole motor industry depends, in no small measure, upon overcoming this greatest country to the progress and position. In a former sense we are the properties of th

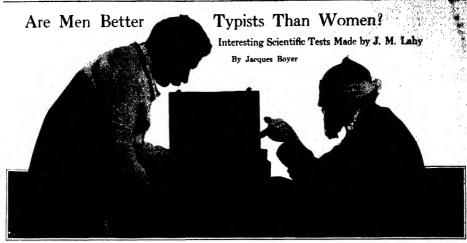


Fig. 1.-Measuring the muscular sensibility with the myo-esthesimeter.

WillAT are the aptitudes essential to success in the type-writing profession? How can these upitudes be defined and measured scientifically? Are men superior to women in the operation of the writing machine? M. Lahy has endeavored to solve these psychological problems, and although like experiments have not yet been carried far enough to allow a definite conclusion

to be stated, they possess an unquestionable social interest In particular, they prove that slow action, perfectly adapted to its purpose, is more effective than rapid but illco-or d in a ted movements, and also that the sensorial reactions of typists are different in the two sexes

From the numerous subjects examined by M. Lahy eleven persons, varying in agreement from twenty to thirty years, we re selectly conjurable. Six of these were women, who had had from two to four years' practice. In ypowriting, and five were mon, whose experience ranged from two to they work or eight years.

In order to effect this classification, the typists were required to typewrite an ordinary text containing 1,702 letters and figures, and their copies were submitted to the judgment of an expert typist After this preliminary test M. Laby dividual, the tactile sense of pressure with ity with the myoesthesimeter, the nudi-tory reaction-time with the d'Arsonval chronoscope, and the muscular strength of each band with the Régnier-Chéron dyna-mometer. He also examined, by means of appropriate tests, the memory for letters and

phrases, the attention and some higher intellectual faculties, including imagination, abstraction, judgment and reasoning.

I will now describe briefly the construction and opertion of the instruments mentioned above.

The haphi-esthesimatric compass of Weber, improved by Toulouse and Pieron (Fig. 3) consists essentially of two fine needles attached to no oscillating lever. The distance between the points of the needles is varied and measured by means of a graduated slide provided with a knob. The operator, holding the compass by its asked applies it to the closed hand of the blindfolded subject so that the two needles exert equal pressures. He then notes the ministum distance to which the needles must

be separated in order to give the impression of two distinct con-

In testing the memory for letters and phrases, site-stein and certain associative in-testing and certain associative in-testing and certain associative in-testing and the desire and the desired instant by pressing a button (see cover). In this way appropriate testing the companies of the desired instant by pressing a button close cover). In this way appropriate testing the companies of the suddenly uncovered by the electromagnet or an expension of the suddenly uncovered by the electromagnet or an opposing apring. The examiner, which is the subject's and the suddenly by the number of version and the suddenly belong enough to make small experimental errors negli-

The acutoness of muscular sensibility is determined by the minimum perceptible difference in weight between two little metal buckers of equal size which are autonomous the minimum perceptible and serves as a bucker is not constant weight and serves as a standard of comparison while the weight of the other bucker is not comparison while the weight of the other bucker is not comparison while the weight of the other bucker is no comparison while the weight of the other bucker is progressively increased by the addition of metal distant. The supportant was not also the contraction of the other bucker is progressively increased by the addition of metal distant. The supportant percentage of the comparison of the

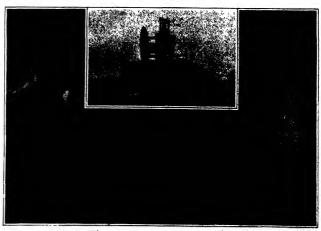
The state of the s



Fig. 2.—Measuring the strength of the hand with Régnier-Chéron dynamometer.



Fig. 3.—Measuring the tactile sense with the Weber compass. The operator holding the instrument by its stem and applying it to a closed hand to give impression of two distinct contacts.



Figs. 4 and 5.—The d'Arsonval chronoscope and the method of its employment in measuring the auditory reaction-time.

### Airbine Reduction Gear in Relation to Battleship Fighting Power

### How Light Reduction Gear Turbines Would Add Two Fourteen-inch Guns to the "Nevada"

ECADEAT exteed, the guiding principle in the dealer A of a battleship is to obtain the mardanum amount of fighting power upon a given displacement, that is to say, the total weight of the ship and her equipment when she is afond, is the capital which the architect has to draw upon in genting out the plans for his ship. Thus, in the case let us say of the "Nevada," a ship of 27% and the "Nevada," a ship of 27% and the "Nevada," a

the "Newada," a ship of 27,500 tons displacement, so much to the displacement is devoted to the displacement is devoted to the hull, so much to the number of the number of the stream and the number of the superdomment of weights to these different requirements, we have in the "Newada" a ship 575 feet long, 575 feet long, 575 the tong, 575 feet long, 575 the tong the superdomment of 25.5 knots, and carrying a biterport tent 1-times pum a biter of tent 1-times pum. It is the superdomment in the various elements of the ship which results in what we believe to be the most decenter bettleship of her displacement in the world to-day.

Bome other naval architect, bowwer, realizing that he had the great displacement of 27,500 tons at his disposal, might have decided that such a ship should carry a heavier battery and he might have designed one of the same sise, mounting twelve in place of ten 14-inch guns. But in doing so he would have been obliged to, sacrifice some other valuable feature in her design.

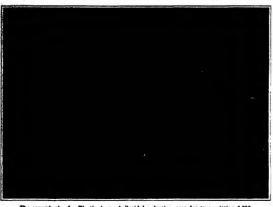
He would have found it necessary, let us say, to reduce the thickness of the armor to that of a battlecrutuer, or it would have been necessary to reduce the amount of coal carried and give to the ship a less generous amount of ammunition and etores; in short, he would have been obliged in some one, or in several ways, to servifice certain features which make the "Nevrada" used a fine all-round fighting unit.

One of the largest drafts made upon the displacement capital of a warship is that for the boilers, eugines and fuel supply; and for many years it has been

realized that, if some change of motive power, or some radical change in existing met could be made involving a reduction in weights. it might be possible, on the same displacement, to produce a ship of greatly increased fighting pearance as a practicable drive, it was predicted that its high efficiency and decreased weight would render this possible; but that these expectations have not been realized is shown by the fact that the "Oklahoma," sister ship to the "Nevada," and of the same displacement and armor protection, is being equipped with triple-expansion, reciprocating engines. It was hoped that the heavy-oil engine of the Dissel type would make possible the desired reduction in weight; but at the present writing It is agreed among the most experienced builders of oil engines, that there is little hope of this type of drive being installed in battleships for many years to come. During the past few years however, there has been brought to perfection an adjunct of the steam turbine which promises to enable that most efficient engine to ises to enable that most success. Successful demonstrate its full economy, both in weight and in fuel consumption, as a drive for ressents of the navy and merchant marine. We refer reduction gear, a device which makes it possible to combine the most economical type of

possible to combine the most economical type of a invitine with the most economical type of propeller in any given ship. The difficulty with the marine invitine is a fundamental cone. It lies is the impossibility of reconciling the high speed of rotation necessary to secure high difficulty in the truthen with the low speed of rotation which is necessary to secure high self-culvey in the proposite. If the truthen is run at the marinium efficiency speed, there is a great loss of efficiency in the propolate; if the propolate is run at the own marinium efficiency speed, there he a consumption, of sheams in the truthine out of all proportion is the proper distincted.—A A high parapheral velocity is

necessary for the turkine blades, if they are to utilise the energy of the stems efficiently, and hence if the speed of rotation is limited, the desired peripheral speed dots he secured only by an increase in the diameter of the rotor. This brings with it the disadvantage that the turbines become objectionably large, and heavy to handle during inspection and repairs. Furthermore,



The apurwheels of a Westinghouse helicoidal reduction gear for transmitting 6,000 horse-power at the station of the Cleveland Electric Illuminating Company. Efficiency in sheep test ever 95 per cent.

the large casings necessary in turbines of great power, are liable to expand unevenly when the steam is first somitted. This is liable to bring them in contact with the blades, whose clearances are necessarily very small, strip them from the rotor and necessitate the return of the orthogonal ship to the navy yard.

During the past few years, a large amount of costly experimental work has been done in the endeavor to introduce between engine and propeller some form of reduction gear, by which the high speed of the turbine shaft could be reduced to the relatively low speed of

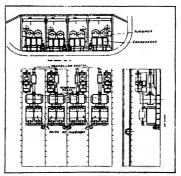


Diagram showing saving of space by using mechanical reduction gear with high-speed turbines in the engine room of a 20,000-ton battleship. Saving of weight is 400 tons.

the propeller shaft, without any serious loss of efficiency. These efforts have resulted in the production of three types: I, the electrical, in which a high speed turbles is direct connected to a generator, current from which drives a motor direct connected to the propeller; II, the hydraulic typs, which introduces between the power and the propeller shaft a reduction great, which may be broadly defined as a centurical pump and a water wheel; III, a straight mechanical gear, consisting of a pinion on the power shaft gearing with a spur wheel on the propeller shaft. Type my the propeller shaft.

number one, for which an efficiency of 80 to 05 per count is claimed, has been instalted on the United States collier "Jupiter." Type number two, which has shown an efficiency of 90 per cent in a brake test of 10,000 norse-power, is being installed on a large scale in a German merchant ship. Type number three, of which the Westinghouse-MacAlpine reduction gear is the best

known type, has been placed in the collier "Neptune," of 19,300 tons displacement and It knots speed, in which it has shown the same mechanical efficiency of 98 per cent as was reveated by the preliminary shop tests Parsons, of turbine fame, has made some smailer installations on this principle, in high-speed passenger boats, which appear to be giving good satisfaction. At the ores ent time, moreover, there land service 22 sets of Westinghouse gearing with an aggregate horse-power of about 20,500, and present an illustration of one of two sets of 6,000 horse-power which are now in service at the station of the Cieveland illuminating Company Fifty-four addlional sets of gears, having an aggregate horse-power of 67,000 horse-power, are under construc-

The distinctive feature of the Westinghouse gear which, as can be seen from the Hustantions, is of the double helicoidal type, is that the platon shaft and hearings are supported hydraulically in such a manner that there is an automatic equalization and distribution of the tooth pressure. This effect is secured by locating an hydraulic

sure. This effect is secured by locating an hydraulic epilheder and piston under each of the three pinion shaft bearings, which are held in a common frame The lubricating oil enters the bearing at the region of low pressure and is carried around to the region of high pressure, where a portion of it is discharged through an opening leading to the hydraulic cylinder Under this arrangement, the frame in which the pinion shaft is carried floats upon the oil contained in the hydraulic cylinder, and, since the pressure in these is paramitted to equalite, there is a resulting automatic all these of the pressure in these is paramitted to equalite, there is a resulting automatic all these of the property of the proper

alignment of the philon teeth with those of the main gear, and there is consequently a uniform distribution of tooth pressure. The smoothness and entire absence of noise suggests that a custtoning effect is obtained by a small amount of entrained air which amplifies the effect of the floating bearing

moture nearing. Tests which were made at the Westinghouse shaps with a turbine of a capacity of 1,000 kilostati, at 3,000 revolutions per minute, broacht out the very important facet for many the broacht of the property of the property of the property of the property of the range of power, and with no squared diminution at the highest power attailed, and this in squite of the facet that the turbine was being operated at double its ratted capacity. In fact, the tabulated results showed that, as the flow of steam was increased, the water rate was reduced. This reduction, moreover, was tabulated to the fact that the flow of steam was increased, the vater rate was reduced. This reduction, moreover, we want to the property of the

Important as are the galas in efficience, they are, if possible, overslandowed, particularly for naval insuliation, by the great saving which may be secured in weight and space, the effect of which in increasing the fighting power of a battleship without increasing its displacement is referred to later in this article.

The principal mechanical and operating advantages of this drive which have recommended it so strong to naval engineers are: One, that tight steam pressures may be used with superirest and that the turbine may be started quickly from the cold condition without danger of casing distortion and binde stripping. Two. the smaller size certaint but turbine casing to be made

COMPARISON OF BATTLESHIP MACHINERY WITH AND WITHOUT REDUCTION GEAR

	Parsons Turbine Direct Connected	Westinghouse Geared Turbines.	Baving Per Cent.
Shaft 11. P. for 21 knots speed. R. P. M. Propellers for 21 knots speed. Number of Turbuses Number of Propellers Weight of Turbines and Gears Weight of Turbine Shotor (dargest) Number of Feet Turbine bladdes (about) Weight of Largest Turbine shodes (about) Weight of Largest Turbine shodes (about) Weight of Largest Turbine shodes (about) Weight of Largest piece of the Complete Pilor space occupied of turbine Weight of Largest piece S. H. P. full speed turbines only Total steam, all purposes, full speed	32,000 230 8 (4 different sizes) 6 tons 90 tons 1,000,000 270,000 4,762 sq ft. 30 tons 11 75 lbs. 417,000	29,200 180 8 (all same size) 4 4 300 tons 1 8 tons 120,000 21,000 11 1 tons 3,168 sq. ft. 4 tons 11 ibs.	50 94 88 92 91 33 3 86 6.4

in two parts, with the elimination of circumferential toints and reduced cost of manufacture. shorter and lighter rotor makes possible the use of a sliffer shaft and the practical elimination of vibration with its consequent blade trouble. Four, the upper half of the cashig may be bluged and the turbine rendily opened for inspection. Five, the very great reduction in the number of blades greatly lessens the danger of blade stripping. Six, the smaller size of the turbine makes it possible to place the condenser directly bemeans it possure to place the condensor directly be-neath it—thereby securing a inhiminum loss of pressure and eliminating the large and cumbersome exhaust pipe —and use the shell of the condensor as a foundation for the turbine

What Reduction Gear Would do for the "Nevada." By way of illustrating the advantages in the way of space and weight saving and the more convenient size of the parts to be handled to repairs and overhauling we present the accompanying tabular comparison and some diagrams showing eight small turbines geared in pairs to each of the four propeller shafts. The com-parison speaks for itself; but we cannol refrain from drawing attention to the reduction of 50 per cent in the weight of turbine, to the fact that the weight of the weight of turning to the fact that the weight of the largest rotor is reduced from 30 tons to 1.8 tons, that of the largest turbine complete from 120 to 11.1 tons, and that of the largest piece of turbine from 30 to 4 tons. Furthermore, it should be noted that the reduction of 13 per cent in the total steam used will mean a further reduction in the weight of the botter plant and in the weight of coal carried for the same cruising radius

A Twelve-gun "Nevada."

Now the reduction in the boiler plant and accessories due to the 13 per cent saving in steam used, would ut a very conservative estimate service un additional say ing of 50 tons of weight, which, added to the in turbine weight, means a total saving of 350 tons in molive power nione. And this, the naval architects will tell you, means that there will be about an equal amount of weight saved in the ship itself, making a total saving by the introduction of the reduction gear of some 700 tons. This, in turn, means that the iwo 2-gan turrets of the "Nevada" could be increased to 3-rm; furrets, and thus we would secure an improved ada" of only 27.500 tons, carrying twelve 14-luch, which is the battery that will be mounted on the 31,500-ton "Pennsylvania."

The ten-gun "Nevada" costs about twelve million five

hundred thousand dollars. The twelve-gun "Pennsyl-vania" costs about fifteen million dollars. The extra valua" costs about fifteen million dollars. The extra two gaus and larger tirrive to a reducibin goar driven "Nevada" would fairly well offset the saving in welght of molive power if this be true, a twelve-gau relation "Nevada" with reduction gears could be built for \$2; 000000 loss cost tani a twelve-gau "Pennylvania" without reducion gears; which would mean that it would be possible to intill six twelve-gau. "Nevadas"

for the same cost as live levelve-gun "Pennsylvanias."
This article is not intended as a criticism of the design of the "Pennsylvania" The increase of 4,000 tons over the "Nevadal" covers not merely the additional two gams and their mounting, but many features, pre sumably, in the way of better protection, larger fuel supply etc. We merely wish to point out that the "Nevada," the most completely armored ship in the world, can be made to carry two additional 14-inch gams by a mere redesign of her motive power

by a mere reassign of her notice pawer.
We commend these facts to the serious consideration
of the Bureau of Construction and Repair and that of
Steam Engineering when they come to prepare the plans for the three new buttleships which the Secretary of the Navy will recommend to Congress.

### New York Electrical Show

Tile New York Electrical Exposition and Motor Show of 1013 opened at the Grand Central Palace, Wednesday, October 15th, and will couldnue until Saturday, the 25th, inclusive

The exhibition is well supported by the Federal Government. The Department of Agriculture illustrates

with pictures, models, and maps what the Govern is doing toward the protection of our forests. There is an erosion model which shows the effect of streams on denucled land as against well-forested country. The methods of signaling and fire fighting form an inter-esting part of this exhibit. The Department of Comand Labor illustrates how statistics are tabulated by the Bureau of Census with electrically ope meet of the Bureau of Census with electricity oper-uted punching and sorting mechines that take card re-ords at the rate of 450 a minute. Another popular exhibit of this despartment is a model of the Pedro Miguel lock of the Panama Canal. The model, 20 feet long and 5 feet wide, shows the actual operation of resulty least from one lead to the actual. passing loats from one level to the oth partment of the Interior is represented by a model of an authracite coal mine in operation, and shows how in the modern mine nearly everything is done by elec-tricity. The attention given by the Government to units and measures of electrical quantities is demonstrated in the exhibit of the Bureau of Standards; while the Reclamation Service shows what is being while the accumulation service shows and is being done in the West in the development of water power for the generation of electricity. In one corner of the building there is a fully equipped mint showing the process of manufacturing coin from the crude material to the flusi stamping press. The United States Navy is represented at the exhibition by the bridge of a battleship in regular working order, which demonstrates the electric signaling devices used on our war ve In addition to this, deep-sea sounding apparatus and in addition to this, declines councing apparatus and pavigating instruments are shown. Field wireless and time firing apparatus for coast defense guns form the interesting features of the United States Army exhibit. In addition to the Federal exhibitions there is a State

exhibit of model locks and spillways on the Barge Canal, while the Bureau of Municipal Research also shows how the affairs of New York city are now being

One of the special features of the present show is One of the special returns of the present show is the purt that electricity is now playing in medical mat-ters. The section devoted to electro-therapeutics com-prises more than a dozen separate exhibits. One of these consists of a model hospital, where every concelvable form of electrical apparatus has been installed for the benefit of the patient and the surgeon. There are high-tension machines, galvanic machines, sinusoi dal muchines, machines for ultra-violet light treatment, dal machines, macmines no untre-vance man coemisco. X-ray machines, electric ficultators, beth cabinets, elec-rically heated blankets, etc. Particular stress is laid upon the use of Roenigon rays in locating trouble in various parts of the body. In this electrical hospital may be seen a large electro-magnet with which iron and steel particles may readily be removed from the eye or from the skin.

As usual, the growing use of electricity in the b hold holds a prominent position in the exhibit are the customary devices for cooking, cleaning, washing, etc., which have now become standardized and show only minor improvement over those exhibited in previous years. At one side of the second floor is the electrical grill and ten room where electrically cooked meals are served. One electric power company demon-strates what can be done to the equipment of a build-ing for electric lights, including all the fixtures, on an expenditure of \$60. Another company advertises to fit up any city house within its area of operations for \$49. This company also shows what can be done for 10 cents by the use of various electrical apparatus and

On the top floor of the exhibition hall there is an etectrical farm and dairy. Four white cows are daily milked by electricity. The method of clarifying the milk, separating it, pasteurizing the cream and cl milk, separating it, pasteurizing the cream and churning il into butter, all by means of electrical apperatus, is here shown. The farm also includes a poultry yard and chicken hatcheries where baby ducks and chicks are hatched during the exhibition.

illuminating engineering is well represented by vari-ous types of imps. Special attention is shown to the reproduction of daylight by which colors may be matched. To demonstrate the ruggedness of tangeten lamps a bumping device is used which subjects the lamp

to severe jars without injusting the disment. The nitrogen-filled lamp will probably be on exhibite fore the show is over. This base, as our redders i will operate with very high efficiency, consuming 1/2 watt per candle-power against 1 to 11/2 watts of present tungsten lamps.

The motor truck is well represented by any number of exhibits which demonstrate the increasing use of the electrical commercial vehicle in the city and in places where electric current is readily available. At the top floor of the exhibition, there is a demonstration track and an electrical garage, completely equipped with battery charging apparatus, demonstrating the simplicity of the charging operation.

### The Destruction of the Zeppelin Airship "L II"

S we go to press news is received of the terrible dis-A steer in which the new Zeppelin naval airship
"L. II." was totally destroyed. It is said that the versel exploded in midair and that every one of the twenty-eight officers and men on board lost his life. Among those who were killed were members of the Admiratity Board, who were testing the airship before accepting her for the government. It would be both unwise and un-safe to venture any discussion of this, the most frightful accident which has occurred not only in the history of Zeppelins, but in the whole history of aeronautics Our readers may rest assured that a critical discussion of the catastrophe will appear in these pages as trustworthy information is received from G rmany.

In last week's Scientific American a brief descrip-tion of the "L. II." was published. The vessel, it will be remembered, was the most pretentions thus far constructed by the Zeppelin Company. She had a length of 487 feet and a beam of 50 feet. Indeed, she was so large that a special shed had to be constructed in order to bulld her. Unlike previous Zeppelins, she was provided with three cars instead of two. The third new car was the equivalent of the bridge of an ocean-going car was the equivalent of the struge of an occusingoing steamer; for it was used only to navigate the craft. The passageway connecting the cars was contained within the hull and was not suspended beneath it, as in the past.

No sirsing thus far constructed has ever b powerfully engined. The "L. II." was driven by four separate engines in two separate engine rooms. The total output was 800 horse-power, enough to drive the total output was not not believe the conditions, at a speed of over fifty miles an hour. A trial trip undertaken on September 6th last was considered satisfactory.

### New Railway Signal Experiments in France

ONE of the leading French railroads is engaged in making trials of apparatus for giving automatic signals to the engineer upon the locomotive in con-nection with the usual track signals, and in order to test the method on a large scale it is fifting out the lines from Paris to Dijon and other sections to the extent of 250 miles of double track, upon which there are 268 disk signals. As many as 140 locomotives are equipped with automatic devices, and these consist of contact brush mounted under the front of the locomotive, and in the middle of the track. At the proper place the track has a short place of electric rail which is curved so that it rises for a certain distance and the brush can make the contact with the surface. The current thus enters the locomotive and works a magnet device for a steam whistle placed near the usual one, but having a lower tone, and this shows the pres ence of a "stop" signal at the point in question. Corbined with the usual speed chart is a device for regi tering the present signal. The engineer then cuts off the special whistle by pulling upon a cord.

### The Current Supplement

In this week's issue of our Supplement Mr. J. J. Ide gives an account of the recent swiation meet ut Rheims, France, and the contest for the Gordon Ben--Messrs. Langmuir and Orange's paper before the American Institute of Electrical Engineers on their work on the nitrogen-filled tungsten lamp will be pub-lished in full in this and the following issue.—Mr. J. W. Fewkes' article on stone monuments is conclud in this issue.—There is a common impression that the staling of bread is due to its drying, i. e., to loss of moisture. A recent investigation by Dr. Kats, reported upon in this week's issue, has shown that this im-pression is erroneous and that the staling of bread represents a reversible change of state similar to that of red mercury iodide into the yellow variety.—The or red mercury localization the yellow variety.—The interaction between passing ships, which, it will be remembered, led to a serious accident to the "Olympic" and the "Hawke" soon after the former was launched, has been made the subject of a curoful investigation by Port. Goodson in collaboration with Mr. J. H. Thompson. Their report is published in this reach. Wook's Superaware

### Correspondence

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ore are not responsible for states correspondence column. Assaymons counci be considered, but the nem-le will be withheld when so desired.]

#### The Ten Most Needed Inventions

To the Editor of the SCHNTIFIC AMERICAN I am very much interested in the results of the con-st "What Are the Ten Greatest Inventions?" I would also like to know from you or your readers what are the ten most needed inventions or discoveries. Baltimore, Md. WILLIAM HURT.

### Wanted: A Humane Animal Trap

To the Editor of the SCIENTIFIC AMERICAN: The publication of the appeal signed by George Fos ane animal trap, wi well for a h for inowes: for a number animal trap, which appeared in the September 18th issue of your valued journal, is a step in the right direction.

I admire the humanitarian motive that prompted Mr.

I admite the humanitarian mouve teat prompted and. Howeli to write you, for to anyone capable of reading between the lines must appear in all its horrible details the death agony of millions of animals which have been caught and crucified in this barbarous manner, viz., by the old-fashioned steel trap with its terrible cruel grip.

May I suggest that if one of the humane societies would offer a prise of \$500 through the Sourstiffer American for such a humane animal trap, which would immediately kill without torture, it would be forth-A. JOCELYN H. MAGRATH. coming within a year. New York city

### A Possible Case of Telepathy

To the Editor of the SCIENTIFIC AMERICAN

I quite agree with your reply to Mr. Richardson on I quite agree with your reply to far, accession on the law of magnetic communication between human beings. The analogy between telepathic and wireless telegraphic communication seems to me most remote. A recent circumstance, which seems more than "coincidence," has upset my ideas as to any law of telepathy

Last winter, as wife of a State Representative, I spent a large part of the three months' session as a visitor in the galleries. I knew the sergeant-at-arms

in the most desultor; way. I spoke to him probably not more than half a dozen times during the session. About two weeks ago, the thought of Mr. B—came to me repeatedly one afternoon. I remembered an sot of kindness to my husband. I thought of his an act of kindness to my husband. I thought or his conduct on certain stormy occasions in the House of Representatives. Quite suddenly the thought came to me that he was in trouble. Irritated at spending ich time and imagining on a comparative strange

I resolutely turned my thoughts elsewhere.

The next day's paper contained an account of his death by drowning on the previous afternoon.

This seems more to me than accident. I am positive that I had not once before thought of him since the close of the regular session in March. Mas. X. Austin, Tex

### A Plea for an Increased Patent Office Force

To the Editor of the SCHENTIFIC AMERICAN As yours is a scientific journal, it is to be prethat you will welcome any suggestions that may offer a feasible remedy for the congested condition of the United States Patent Office. It will be observed from the weekly reports of the Official Gazette that the num ber of applications awaiting official action is ste increasing, and it is obvious therefore that the Office force is entirely inadequate to cope with the business of the Office, and some solution of the problem must be devised, or the interests of inventors and the people at large will suffer in consequence. On May 13th, 1913, the number of applications awaiting actives 27,465, and on September 30th the number his d to 30,128, this being an increase of 2,663 in four and one half months, or a yearly increase of about rour amo one natt months, or a yearty increase of about 7,000. From these figures it is obvious that Congress should provide a remedy for the existing evils, which are becoming greater every year, and that must soon be remedied or our whole patent system will be greatly impaired in its usefulness. Because of these facts will you allow us to offer a few suggestions, having in view the expediting of business in the Patent Office? First, that the number of divisions be increased from forty-three to at least fifty, and that the Office force be increased in like proportion; and second, that the number of applications pending in the various divisions be over or approximate penning in the various dynamous or equalitied as nearly as possible, so that inventors of all classes of inventions will stand an equal chance in the allowance of patents. Now it will be observed that there is a great disparity in the number of applications pending in the different divisions; in nine there are

over 1,000 in each, and in two of these there are over

1,800 in each, while in sixteen other divisions there are less than 500 in each division. Now it is obvious that these disparities in numbers should be adjusted, unless there be some substantial reasons for their retention st and that do not admit of a remedy The inveitors of our country and the world pay the entire expense of the Patent Office and leave a surplus of \$68,000 yearly to the Government, as clear gain. of these fa cts, are they not clearly titled to the very best of service and an early alle ance of all patents where the nece EDWARD W. OWENS. plied with?

Wagner, S. Dak

### How the Indians of Peru Use Coca Leaves

To the Editor of the SCIENTIFIC AMERICAN

An article in your issue of the Scientific American's September 20th attracted my notice, under the fifte What Is Cocs?

ought perhaps it might be of interest t many readers to say something more about the way, and to what extent this plant is used, principally by the Indians of Peru, partienlarly in the high altitud

In the latter part of 1910 and early part of 1911 I was at La Fundicion and Cerro de Pa o, Peru, an altitude of over 14,000 feet. I saw there the Indians chewing these coca leaves, and they surely must be a powerful restorative and stimulant. To illustrate: One day. was snowing and raining, an old Indian, ragged, dirty, and altogether a picture of misery, ambled in to the number yard, and directed his weary steps to a large pile of lime, which was partly exposed to the rain. There he sat down and drew his pouch of coca leaves around to the front, and commenced to fill his month with them. After this procedure, he stealth-ily reached down and picked up a piece of lime about the size of a hazel nut and put that in his mouth with the leaves. I was secretly observing his actions, and waiting for the expected effect. In about two minutes the old Indian's face was wreathed in smiles, and he glauced furtively from one side to the other as if he expected someone to intrude or disturb his pleasant sensations. When he thought all was secure he threw out his chest, and commenced to take notice of his tori and dirty clothing. A torn place in the knee of his emed to annoy him considerably, for he re peatedly tried to fold it up and stroke it away, as if eted it to disappear entirely, and would occasionally fleck away a particle of dust.

stonauly neck away a particle of unit.

The power of endurance of these indians is surprising to Americana. Men, women, and children are carriedy more than heasts of burden 1 saw an Indian boy not over fourteen years of age and not over clickly pounds in weight carry one hundred pounds of coal up a long hill for several hundred yards without resting.

The women are often seen with one hundred or one hundred and fifty pounds of coal in a poncho, struggling up a hill, with a baby perched upon this psucho, and the old woman spinning ilama wool, which is wrapped around her left forearm to a spool and spindle. She spins with her right hand, with apparently no thought of the load she is carrying.

I suspect that the women use cora leaves as well as the men, and also the children to some extent Atmost every Indian man is equipped with a psuch, made from a cow hide or the hide of some small animal, with the hair always on the outside

se leaves sell in this locality at five cents per pound. I am inclined to believe that cora leavemore extensively in Peru than in Chile, for I was in the Andea Mountains in Chile and never rememb ving seen them used by the natives engaged in similar work to that of the Indians of Peru

W H. REAGAN.

### Repelling Aeroplanes from the Ground

By C. Dienstbach O far as military flying is concerned, the real lesson that the contract of th military officer foresaw, the ordinary rifle proved far more efficient than artillery in forcing aviator scutts to withdraw. Field cannon cannot be discharged at high angles, and even howthers have their limitations in that respect. The experimental aerial artillery thus far constructed fails to meet other obvious requirements. The repelling of torpedo boat attricks by lattice-lips requires special ordannes which must be expable of very quick handling if it is to be of-fective at all. Yet this lesson, taught by every nary in the world, seems to have been quite lost upon those who seek to reorded our armies with artiller, for those who seek to provide our armies with artillery for the repulsion of aeroplanes. What is needed is evian serial gun so mounted on a pedestal that the pointer can haddle it like a rife, raise it at an elevation of 70 to 80 degrees, swing it around and aim it by means of a shoulder rest or butt.

It is worth mentioning that in 1871 Krupp made such a gun for the express purpose of bringing down the

balloons which easily escaped from Paris during the siege. It is obvious that the catifier of such a gun must be small, so that the piece may be swung quickly without the aid of mechanism. Large caliber is less sential because shrapnel is not very efficient if the range is not only unknown, but also subject to quick change. Moreover, iong ranges must be attained, not by large caliber, but by high initial velocity in order by large cannor, out by high minn relocity in order to carry the shell as quickly as possible to the target; otherwise it will be necessary to aim so far ahead of the rapidly and irregularly moving object that exact firing is out of the question and all alming merely guesswork. Long range is essential because adjustable eights are in a way useless against aircraft. Only a point blank fire can reach a prying aviator with any degree of certainty. It is very important to note that the point blank range increases with the angle of sight, At 90 degrees it is infinite; nt 80 to 70 degrees it is well-nigh 80 to 70 per cent of the total range.

In the light of all this it is not difficult to underwhy the high-powered modern muskets used in the Balkans, which met most of these requirements, ed as well as they did against aeroplanes could be quickly and readily pointed at the steepest angle, and the high initial velocity of their ne pointed bullets gave them a very great point blank range. These needle-pointed bullets, invented not so many years before the flying machine's advent, seemed actually to have anticipated the military aeroplane it-They increased the horizontal point blank range from 800 to some 1,500 feet. No wonder that in the recent war the Balkan pilots soon felt safe only at the great belight of 6,000 feet. The highest sight of a rifle exceeds a horizontal range of 6,000 feet by very

ilttle; yet 2,500 feet above Adrianople a Russian pilot on the Bulgarian side missed death by the lucklest chance, three bullets plereing the floor of his ear.
The German pilot Scherr, with the Turks, tells of four rifle balls that hit the planes of his machine. Three of them pierced members of the frame at a height of

The effect of musketry fire against aeroplanes in the Tripollian campaign was not so marked as in the Balkans because there were not enough skilled marksong the few Turkish regulars and the many Arabian irregulars to whom a modern rifle was not a mysterious piece of mechanism. The seasoned men of a European standing regular army, all fumiliar with muskets, would have given a better account of elves

An aeroplane over an enemy's position draws the concentrated fire of hostile marksmen, who may be scat tered over a great expanse of ground and therefore among their great numbers invariably include whole crowds of exceptionally skilled sharp-shooters

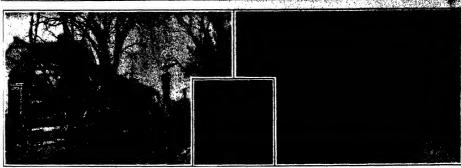
At 5,000 feet an aeroplane seems so small that it is hard to find when once lost from sight. High skill in marksmanship is essential to hit it Because rifles are always more numerous than cannon, a company of marksmen may make it uncomfortable for an aeroplane even though its height be 5,000 feet. At that distance from the muzzle the actual scattering of the bullets, even from a rigidly held rifle, is such that a certain becoming of hits is almost sure to be scored. Hence it becomes very essential to armor the men and the vitals of muchines. Since the striking energy of a buliet after it has reached a height of 5,000 feet is paratively low in spite of its tremendous penetration at shorter ranges, very light armor will serve its pur

### Panama Hat Industry in the Philippines

ONE of the ambitions of the enterprising Philippine Bureau of Agriculture is to introduce the Panama hat industry into the Philippines. The plant from which these hats are made, Carludovica palmata, is now cultivated in Java, where hats are being woven from its icaves by Javanese women and children, and the product is said to compare favorably with the common grades turned ont in South America. The method of preparing the leaves is very similar to that used in the Philippines in preparing sabutan leaves for weaving sabutan hats. The Filipinos are skillful hatmakers, and in certain parts of the islands but weaving is the chief household industry. Experiments in cultivating Carludovica palmata are now under way at the Lamao and La Carlota experiment stations in the Philippines

### A Radioactive Iron Mud

THE famous St. Antal spring in Austria deliverradioactive water of marked therapeutle value, but it has been shown recently that the mud deposited by the spring has a much higher radioactive value than the water. This is the more interesting because this mid is mainly iron oxide, Fe<sub>1</sub>O<sub>2</sub>, which on heating, dissolving, reprecipitating and drying yields increased ac-tivity. Since the emanation acts differently from those of radium, thorinm and actinium it is concluded that there must be present some new radioactive element similar to ferric tron.



An overhead conveyor system.

A completed section.

Sewer ready for the arch forms.

### The Passaic Valley Sewer

### Plans for Securing Wide Diffusion at the Outlet in New York Bay

Fig. 1. The last twenty miles of its course, the l'assate little better than an open sewer. The sewage from a population of two thirds of a million pours into this singsids stream, and its bottom is cloudy with the second with deposits that have accumulated for years. The liquid and footling matter move leducity into Newark Bay, and eventually find their way through the Kill von Kill into upper New York Bay, whose waters are niterady surferied with sewage from New York city, thence in due course they reach the ocean. A small part of the sewage sho passes through the longer course provided by Arthur Kill and Staten Island Sond into the lower has

For years the 'Insede River has been considered a memor to health, and if was decided some time a memor to health, and if was decided some time a memor to parallel the river, from Puterson on, with a large truns sewer which would intercept not only the sewage that now pours hitch the river, but also that of several more towns included in what is known as the Passel Valley District. The area of this district is elghly square miles and it contains twenty communities or townships. The total population thus served would be about three quarters of a million. At the present rate of growth, it is estimated that in 1940 there should be 1.6 miltion himbitants in this area. The principal contributors to this sewer must always be Paterson at the head of this sewer, with 125,000 lababitants at the present time, and Newarks at the month of the Passale River, with a population now of 347,400.

As Newark Bay is cut off from direct communication with the ocean, it is planned to run the sewer under Newark Bay, and directly into upper New York Bay, and Robins Heef within the New Jersey State line. However, this has led to a great deal of opposition upon the part of New York State, which contends that the sewage must pass through New York waters.

before it can find its way to the ocean, and New Yorks sewage problem is bad enough now without having to take into consideration the sewage from a neighboring Nate. On the other hand, New Jersey has acreed to establish a treatment station on the west shore of Newark Bay, where the sewage will undergo a thorough mechanical purification. The Passade Valley Sewerage Commissioners guarantee that there will behave of angulerated particles, or objectionable deposits, and of odors due to purrefaction of organic matters outside in the sewage that pours into New York Bay; that there will be practically no greene or color and no injury to public health, or to the property of the United Nates situated in the harbor of New York; and that there will not be cough reduction in the dissolved oxygen content of the waters of New York Bay to interfere will mob te cough reduction in the dissolved oxygen content of the waters of New York Bay to interfere with major dail infe.

This guarantee is under with the indorsement of the United States, which inter-tened between the two States, and which, with the assent of New Jersey, shall have representatives designated by the Socretary of Swar to inspect the conditions and working of the sewer system at any time, to determine whether New Jersey is living up to its contract. Thus New Jersey is living up to its contract. Thus New Jersey is living up to its contract. Thus New Jersey than a mileance to New York, for the very sewage which new flows into New York, for the very sewage which new flows into New York. Buy through Kill von Kull will undergo a thorough treatment and purification before discharging into tions waters.

The method by which New Jersey expects to carry out her part of the contract is interesting. The sower, which will start with a diameter of 3 feet 0 inches in Paterson, will rapidly increase in diameter to 0 feet at Passaft, 0 feet at Suttley and 11 at Newark, reaching the pumping statlon at Newark Bay with a diameter of 128 feet. Here it will like at an elevation of 20½ feet below mean low water, and will pass through treatment works which will be described below. To carry the sweape under Newark Bay a pressure tunnel will be driven through rock 200 feet below sea level. The tunnel will be 12 feet in diameter. On the other side of the bay it will rise to 80 feet below sea level, and will continue at that level to New York Bay, tarminating at an outfall station at Bobias Resf, twe miles offshore. Here it will rise to 25 feet below sea level, so that access may readily be had to valves for controlling the flow of the sewage. From the outfall station, pipes will carry the sewage fown to a depth of 40 feet, before it will be allowed to discharge into the channel.

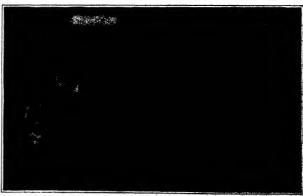
At the treatment station, the sewage will first pass through coarse ercens to remove all floating matter, and then through grit busins and fine screens. Theresfer it will be pumped through sedimentation basins or settling tanks. Provision will here be made for removing grease, foothing matter, and all solids, and the clarified effluent will be forced through the pressure tunnel to New York Bay.

The terminal station in New York Bay, as shown in The terminal station in New York Bay, as shown in our illustration, is an octapuous structure of concrete, which is the terminal station of the control of the control of the terminal station of the control in the control of the control in the future. At present only two of these outfall pipes will be needed in the future. These outfall pipes will be taked, but provision is made for third pipe which may be needed in the future. These outfall pipes are detailed feet in diameter, and they will run down the sloping banks of the reef should 50 feet part, until they reach a depth of over 40 feet below mean low tide. Here the outfall pipes will benach into discharge pipes, extreding across the current and spaced a hundred feet apart. They



Lowering a concrete calason.

. 7



Laying the forms for the floor of the sewer.

Control of the second

are in disperier, he steps, to two feet. Such of regressions will be fitted seits. I may a consider of citing from the top. The beer will be not more fived in the control of the disperies, and will be pasted about two fitted to the control of the disperies, and will be pasted about two fitted to the control of the contr

Brown of the work in progression of the work in progression to Commensaceate the Tennitary of the Pict Flight Ever Made in an Aeroplane.

Made in a Made in Made to the test. The pear time was made by who have been to the was to be been considered in the was 52 minutes and 54 seconds. Next came Frank Minus, also in a 100 horse-power Curtiss biplane, who covered the distance in 54 minutes and 55 seconds. O. Barrin Wood in an 60 horse-power Moissant monoplane nished third, and his elapsed time was 58 minutes

and 15 seconds. The fourth was J. Guy Gilpatrick, who plieted an 80 horse-power Sloane-Dependent over the course in 1 hour 9 minutes and 62/5 seconds. Tony finished last in a 75 horse-power Benoist biplane, his elapsed time being 1 hour 14 minutes and 7



Course of the Passaic valley sewer and territory

ds. The New York Times offered three prizes of \$1,000, \$750, and \$500 to the men who finished first, second and third, respectively. The Aeronautical Society offered a silver cup to the three aviators who finished first, second, and third.

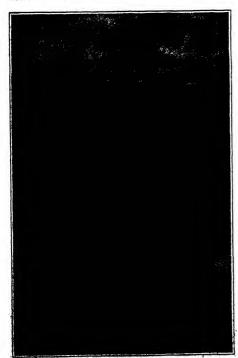
One of the entrants was Albert J. Jewel, who left Hempsteand L. I., on the morning of the derby, intend-ing to land at the starting grounds. He has not been heard from since. Two fishermen saw film drifting out to sea. It is probable that, losing his way above clouds, he perished after his gasoline gave out

### The Balloon Race for the Gordon Bennett Cup

THE international race for the Gordon Bennett Cup, which started from Paris on Sunday, October 12th, was won by the American bailoon "Goodyear," which, was won by the American balloon "Goodyear," which, with Raigh H. Upons and Raigh A. D. Preston on board, covered about five hundred miles. The American balloon "Uncle Sam," piloted by Capit H. E. Honeywell, landed after a flight of about 250 miles on the French coast nouth of Brest. Third in the race was the italian balloon piloted by Agostini. It also descended on the French coast. The "Goodyear" was the only balloon to cross the English Channel Landing within a few yards of a steep ciff on the northeast coast of England, on or a steep cuit on the normens coast or Enguild, on Bompton cliffs, near Flamborough Head, it narrowly escaped disaster. The men on board descended simply because of fog, mist, and wind.

### The Passing of the Sailing Ship

This is the theme of a report from the American consul at Hongkong, and is illustrated in the statistics of that port. Just one saling ship entered Hongkong in the year 1912, as compared with 688, one fourth of the total cutries, in 1876. No suthing ship of European type is now engaged in regular trade to Housekong, and even Chinese junks are being robbed of local business by power vessels of various kinds. In the fiscal year ended June 30th, 1912, slightly over 4 per cut of the tomasse outstook water of the Various scale. ar 1912, as compared with 688, one fourth cent of the tounage entering ports of the l'ulted Stat from foreign countries represented sailing vessels, while in 1884 such ships made up more than 42 per cent of the total entries



sawage where it discharges into Meeting of securing a wide dispusition of the se New York Way.



The terminal station of the Passaic Valley sewer where the pressure tunnel ects with the outfall pipes.

### The Work of Aircraft in the French Maneuvers, 1913

### Aircraft Were Not Conspicuous, But Nevertheless Extremely Useful

By Major H. Bannerman-Phillips

Till most stringent precautions were taken this year to preserve the secrecy of the orders and movements of the two adversaries. The result was to increase the realistic side of the operations, but at the expense of information. Not only, too, have spectators seen very little, but the commanders themselves, and even their staff officers, have found it most difficult to keep in touch with the course of events. Benddes taking cover

In woods, by the side of hedges, in buildings, among bushes, and under certs and wagons, and even railway trucks, during daylight, the troops in a contemporary battle (which may lest for days) will often march by lath. By day they will file, like Hed Indians, under trees and bedgerows, or lie still in the long grass a wavilling the moment to strike. Every precention has to be taken to the long the contemporary of the still of the long grass and direct the distant fire of his beavy artilliery on the closed ranks of a marching column. The result is to undervesse the difficulty of commoding every sort of unit and to make the art of way far more of an intellectual exercise than it has been even in the recent past.

Mist and rain complicate matters and the French airmen had both these and the night marching of the enemy to interfere with their observations

The basts of the grand maneuvers of all arms in France was the victualing of the armies, for which both fresh and chilled meat was to be used, the employment of the aeromentical services, and the trunsport in connection with these two services, in the sree which lies between Auch. Agen, Montauhau and Toniouse, the southern army being leased on Toniouse, the northern army on Agen. Aviation camps specially organized, so that they could be strack and packed on the forder, ready for transport, in less than an hour, were formed at each of these last two blaces.

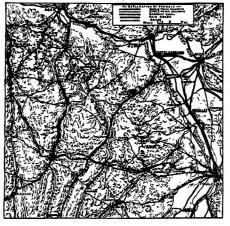
Each side had three "escadrilles" aeronianes with complete transport and cadrille" has been stand ardized as the French military aviation unit, and its personnel and material are designed with the object of keeping six aeroplanes permanently in the field. The short period of the maneuvers can only give an approximate idea of the wear and tear which the strain of an actual cam paign would bring to bear on both the huand mechanical compon unit, but fulriy conservative British estimates bused on the experiences of the work of instruction at Salishury Plain and Farnborough give a very short life to a heavier than-air machine in constant The Biltish Secretary of War has stated that if it is required to have 100 aeroplanes ready to fly at any given mont, there must be 200 to hand, and his critics maintain that in order to have 100 aeropianes efficient and ready for war it is necessary to buy 300 additional machines or the equivalent number of spare parts each year Again, the strain on pilots of aeroplanes is out of all proportion greater than on the pitots of gibles, and the present estimate of the

probable period of efficient dying on active service is three months. If the architor is not to risk physical and nervous breakdown, and the same remarks apply to serial observers. Matters will after for the better in this respect no doubt as time goes on and machines improve, but that is the reasoned opinion of experts at present

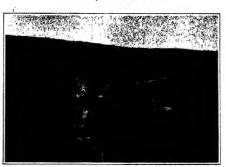
present
The transport for an "cocodrille," accordingly, is intended to carry, besides the personnel, a generous proportion of the spare parts, the field almourne, workshops,
and accophises themselves, complete, but diamounted.
All vehicles are motor-driven except the two-wheeled
prolonges: for carrying accophanes, and these have a
limber attachment, like that of a field-gun, by which
they are higherd as trailers to motor rebilese.

The complete transport consists of three motor cars and two motor cycles (for inter-communication purposcs), six heavy cars, each drawing a two-wheeled trailer or "prolonge," and two traveling workshops. These last are of similar type to those employed by the British Royal Flying Corps at maneuvers this year and known as the "Delahaye" traveling workshops.

The equipment comprises a lathe, drilling machine, grinder, shaptug machine, band saw and circular saw, each driven by its own electric motor, whose actuating



Scene of this year's French maneuvers.



Motor traction played an important part in the French maneuvers.

current is supplied from a dynamo driven, when the cur is at rest, by the 20-30 motor. Fitters' and carpenters' benches are included in the equipment as well as a full complement of metal and woodworkers' tools.

The driver is situated over the engine, thus economising the available length. For somewhat more than half the body-length the lower half of the side availage downward to the horizontal, supported at the outward corners by strong legs, thus forming a valuable extension of those space; the upper portion binges upward, forming a roof to the extension, and a currain is provided against the weather "The machine is constructed to climb very steep gradients and to traverse the worst.

It stands to reason that much money and brains have gone to the making up of these excellently organized and carefully thought-out transport units, and they have stood the test of maneuvers well, with his year and this year.

Last year the work of the acroplaces attracted into attention; reconnaiseances were carried out darty at the hours appointed on a programme regardless of the weather, and the opposing commanders were on the whole kept constantly and accurately informated to movements of the enemy's troops. No serious accident

I'm energy Froncy. No services violence, was sustained by any of he philos, shought some of the mechines suffered considerably. The services recognize restly consentrated assembled at the propose restly consentrated to the propose of the propose

Numbers of seroplanes have been bought by various provinces, societies, commercial houses, and private individuals and presented to the Government service unia and presented to the Government service that the contributions in token of their sense of the importance of French sexial supremacy. The mauhood of French sexial supremacy. The mauhood of French exists through the ranks has the cellightenment to understand the importance of the development of sertial ediclency for war purposes, and acts accordingly.

Last year the aeroplanes at the manenvers were the cruosure of all eyes. Much was expected of them, and they did much, but their work was not so systematic as it might have been. The pitots were mostly picked men, but the accoplane service was in the main more or less of the nature of a keen irregular volunteer force.

ough at this year's maneuvers aere planes have not been seen as frequently, the work performed by them has been better organized, but there has been little or no selection of individuals, either as pilots or observers, for special duties. Instead of the airmen being left to roam more or less without a definite object over dis puted country, they have been dispatched to different points with specific missions to fulfill. From the experimental point of It is on the use of the motor and not on the aeroplane that attention has been concentrated. An elaborate trial of the motor car was made in the victualing of the troops, but the most important test was that made with the new French heavy field gun, which is intended to reply to the 105-millimeter and 130-millimeter Krupp guns of the German army These guns were drawn by specially-built motor tractors of 35 horse-power, which are pro-vided with a drum and chain cable so as to enable them to pull the heavy guns out of soft ground. The tractors can carry a weight of 2,500 kilogrammes, and they can in addition draw a weight of 15 tons behind them. Their speed is 15 kliometers

per hour, and they can climb a gradient of 10 in 100 with a full load. The southern army had seven of these machines, which draw two carloads of abelis and a heavy gun on its carriage. If the seroplanes did not carch the aye their perform-

If the seroplanes did not catch the eye their performances were nevertheless signally useful and much appreciated by the generals and their staffs. One army commander declared that, thanks to his air scouts, he resily knew more about the enemy's movements than about those of his own troops.

The operations were under the personal direction of Gen. Journe, chief of the general staff, assisted by Gen. do Castolnau; this latter officer subsequently attended the British army exercises at the latter end of September.

The forces were divided into a northern and a south ern force; the former, consisting of the tweifth and eigh (Concluded on page 257.)

### Auto Gornies for a Horse

resease to indicate that the horse in the sease to indicate that the horse in the sease had gone in for motoring, but that is set the case. He mede them in his seates, which is that of drawing a cart of refuse from a Los Angeles gas works to be because the sease of the sease of

#### Brick Pavement in a Washout

A seject lesson in the proper grouting age of brick pavements was disclosed
by the recent Obto floods. The roadway
was haveful to a small creek which ratus
had-swelled to the proportions of a river.
A state retaining wall was wrecked and
helf the roadway washed out. The concrete base fell away in pieces, but the
helfs surface stands to-day apparently as
firm as ever and capable of bearing the
weight of an automobile. The unsupported, portion of the brick is eighty feet in
length and seven feet in width. The road
will be refilled and tamped laterally beneath the navine.

### The Pedrail Motor Truck and Trailer

It is some years store the original pedrall steam road iconsortive made it sappearance in Great Britain, and in the meantime many important developments that have been made, which have culminated in a motor vehicle and train working upon the same principle. This system aroused considerable interest at the recent Commercial Motor Exhibition in London. It is the eighth vehicle of its type, and in its design many important new features have been embodied. The most saltent of these new details is the introduction of an antifriction spring-roller chain of novel design, whereby friction is reduced to an insignificant point, the flamps and axis are frietion which existed in former models having issen eliminated entirety.

The machine has a perfect waiting action, similar to that of a certipole, in which respect in differs materially from the so-called "caterpillar." Each foot is possessed of a perfectly articulated ankie, which gives it the desired freedom of motion white negotiating road obstructions. An ingenious means of causing the feet to upproach and to recede from the ground horizontally while preserving equal spacing, has been perfected by bringing the suspension ratis into different planes when guiding the foot carriers. The horizontal approach of the feet to the ground allows of their close proximity when taking or about to take a load, and also prevents any obstructive matter such as stones and so forth from being caught and squeezed

Each pedrati places two and three feet on the ground alternately, and the forve exerted by compressed surings is so adjusted that any two feet together can carry the load for which they are designed, while one foot show would be unable to do so. Consequently, when an abnormal load is thrown upon a stuger foot it simply rises, and the obstruction is passed over without the questomary joint experienced in other vehicles. When three feet come into play, the load still is supported only, there being no lifting effect. This is because the springs are incapitally of the compressed by botts threaded through them, the boils thus being held verticitly, while their lower extremities are free to move sideways, like the qlapper in a bell, and are attached to the foot, which thes is capable of a certain side unclose content of the prings, and which is brought into play when septiating a corner.

play when negotiating a corner.

A motor-driven pedrati vehicle can be used for hauling trailers. These wagons are of similar flesism, but for steering purposes a device known as a "hinged joiat" is employed to attack the trailing wagons



Auto goggles to protect a horse's eyes from dust.



High-tension open-air switching station.



A washout that did not disable a brick-paved road.



Pedrail motor-truck and trailer.



Ornamenting a dam in Austria.

to the tractor. This is a cost steel framework carrying a worm attached to the front vehicle and operated by the driver. The worm engages with a worm-wheel sector on the reserved by using this vehicle in the manuer of a rudder. A motion, controlled by a pivot and guide in the hinged joint, allows either vehicle to the sideways, independently of the other. One important fenture of the mechanism is that since the two wagons are iniged vertically about a point between the centers of the two velicles, the pedralis of the rear wagon traverse the same tracks as those made by the one in front Consequently, if a train of wagons is used the last car follows in the tracks made by the tracks.

#### Safeguarding Operators in Openair Substations

HE progress of the past three or four years in the design and construction substations for very high voltage ser vice has been so rapid along the lines of securing suitable insulation and mechani cal support of conductors, that unless one seen one of the latest out-of-door types of installation for 60,000-volt operation or over, it is not easy to realize how far present standards are from work that only lately would have been thought perfectly satisfactory by transmission engineers. The accompanying photograph taken during the construction of an ont-of-doors switching station in Massachusetts illustrates this point. The importance of ade quate support for the incoming 66,000-volt es is so great that structural bridges 30 feet high and about 60 feet long been erected to support the strain insulators carrying the line conductors and the disconnecting kulfe switches which are always opened before any work can be done on a neighboring oil switch or other piece of apparatus in series with the section. As shown in the photograph the oil switches are taller than a man's head and are mounted on solid concrete foundations to cut down vibration in oper ation The insulating bushings by which the lines enter and leave each switch are of huge proportions in communison with ors are of the disk type, found so satisfactory on steel tower lines. The erection of such an outdoor switching station is a matter of a good many weeks, as every detail must be cared for perfectly to insure safe operation, and every high-ten-sion line wire must be ran so directly that by no possibility can the operator mistake it for another In this station a portion of the overhead work is designed for 110. in this station a portion 000-volt service, and the wires are spaced from 6½ to 10 feet spart Wooden plat forms will enable the disconnecting switches to be handled more effectively when the installation is completed

### Ornamenting a Dam

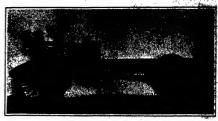
IN the SCHENTIER ABERILAN of a recent date we published an article on the growing tendency to benuilfy engineering works, as far as prossible. This has led one of our readers residing in bounark to send the accompanying photograph of a dain that is being built across the Eibe at Spindelmilihe. In Ameria, which shows that the same tendency prevails in Europe. The dain, which is to be completed in two years, is being built by Italian laborers, because the Italians are more skilled in stonework. The uniternal for the structure is obtained from a near by quarry.

A Novel Amusement Device — Clarence E Bedhent of Pleasant Ridge, Oho, has secured a patent, No. 1,083,049, for an amusement device in which a track having rollers supports a hill which is adapted to travel upon the rollers and also to navigate upon water. The hull has an air propeller and a slip is provided to guide the hull from the water on to the track and means for propelling the hull from the water on the track.

### The Motor-driven Commercial Vehicle

This department is devoted to the interests of present and prospective owners of motor trucks and delivery wagons. The Editor will independ any questions relating to mechanical features, operation and management of commercial motor vehicles.





A three-chain drive.

### Methods of Drive in Commercial Motor Vehicles

By Ross Babcock, M.E.

W HEN first the commercial motor vehicle came into practical existence the question as to what method should be adopted for the flust drive to the rear sate or to the rear wheels, as the case might be, was one that was readily answered and admitted of little or no argument. At that time the chain for power transmission was more satisfactory, from a motor vehicle point of view, than anything else, and as a consequence the

er transmission was nore astractory, from a motor vehicle point of view, than anything else, and as a consequence the chain and sprockets formed the last step in transmission of power from the motor to the road wheels in nearly all of the early machines, and that the judgment of the ploneer engineers was not at fault is indicated by the fact that not withistanding the progress that has been made in other forms of flust drive, the chain is in evi dence in more machines than is any other one ments of effecting the flust drive.

Whether or not the chain will maintain its supremer is a question that is difficult to answer in the face of the improvements that have been made in other means of transmitting power and the resulting multiplication of had driving systems. Chains have been made wastly better than

they were in the days of ploneer motor building; the application of scientific principles in design and construction and the employment of modern steels have had the effect of greatly reducing transmission loss and of increasing the strength and lengthening the working life of the chain and the sprockets, and the chain is the most satisfactory means available for the final drive of the heaviest motor tracks, while it is freely used in machines of all sizes and types, down to the very smallest. Improvements have been made



Combined friction and worm drive.

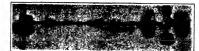


with at least equal rapidity in other directions, we for certain classes of machines the data in being significant by more recently developed mechanisms. Been grant, at one time extremely wasted to prove on prone to rapid wear and noisy operation, oper generation for the link beit or so-ceited "distert" chain, internal symptoms—all have been brought to stages of excellenge that permit their estimated completely machines, to say nothing of the most recent development, the worm drive, which in its original development, the worm drive, which in its original

development, the worm drive, which in its original form had nothing to recommend it except from had nothing to recommend it except going too far to say that to-day the difference access that exist in the matter of transmission efficiency between the best examples of various drive systems are so slight as to be aff but little moment as compared with other considerations, such as compactness, convenience, adaptability to general design and so on. The worm, like the bevel gear, requires close and tight housing for the purpose of excitiding dust the theory and retaining intricant. Thus they work at all times under very favorable conditions, so far as inbrication and protection are concerned. The chain, on the other hand, is a somewhat difficult thing to income, and as a result the wast majority of chail-driven machines run with chains and sprockets expeed to the dust, which



A typical worm drive.



Double reduction shaft and spur drive.



Internal gear drive



Worm gear and its housing.



Grarkener waste deles

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they gather freely, to the shortening of their lives and the decreasing of their efficiency. The fact that chains will operate even fairly matisfactorily under such untoward conditions expiains in no small sasure the persistence and popularity of the chain drive.

In the commonest form of chaln drive two chains drive to sprockets holted to the inner faces of the road wheels, transmitting power from a countershaft mount ed on the main frame of the vehicle forward of and parallel with the rear axis and carrying the differential gearing. The countershaft is commonly driven by bevel gears from the tall-shaft of the gearset, the housing of the differential gear and that of the gearset being either integrally formed or else bolted together to form a rigid unit. In the heaviest class of trucks this system is practically alone while in machines of from three to six tons carrying capacity it is more in evi-dence than any other method. In lighter machines employing chain drive there is more variation in the method of using chains, if for no other reason than that the difficulty of meeting requirements as to strength is much less, and consequent ly there is more latitude for conside other things. In some very light vehicles the rear axle is of the live type and the differential carries a sprocket which takes the single chain. This arrangement is often employed in small commercial vehicles with planetary change-speed gearing mounted on an extension of the crank shaft of the horizontal motor—a type of power plant and transmission that is well adapted to and very often used for light service. Light trucks with friction disk transmission of power also are fitted with single chain drive, in some cases the chair being of the silent type and inclosed.

While it has been said that the double chain drive is more commonly employed than any other one form of final drive, it should not be forgotten that bevel gear drive is the almost invariable complement of side chain drive, the bevels driving the countershaft, as already mentioned. Considering the matter from this poi view, a little of the importance is lifted from the chain and shifted to the beve gear. The beyel, however, is becoming of sing importance as a final drive purand simple. There can be no doubt that its development in the pleasure car field, in which it is practically the only aystem of final drive, has done much to further its use in commercial cars, not only through example, but because the system has been so far perfected that it can be subjected to the stre sees and the wear and tear of commercial service without fear of undue trouble either from wear or breakage. Given a pair of properly generated bevel with accurately fluished and hardened teeth, the chief requirement is an absointely rigid mounting that will permit the requisite close adjustment of the gears and will prevent movement tending to destroy the accurate alignment, our secured. Obviously the bearings must be of a sturdy type capable of withstand-ing the necessarily heavy loads without excessive wear and adapted also to sup-port the driving berel pinion at a point as close as possible to the teeth. For this purpose ball and roller bearings of sev eral forms are employed with satisfactory torque are avoided by introducing uni-versal joints at one or more points be-tween the tall-shaft of the gearset and the bavel pixton. The propeller shaft may be run through a tube forming a unit with the differential housing, in which case the shaft forms practically an extension of the bevel pinton shaft, or it may be jointed at both ends, in which case fhe is

tube may be, and usually is, omitted.

Worm drive is peculiarly interesting because it illustrates the fact that what man wants man will usually get, if he knows enough and tries hard enough. The worm drive in use before the advent of the automobile was crude, to say the least, by comparison with the present type. It was created to go and the attempt to the automobile was crude, to any the least, by comparison with the present type. It was competed and had the advantage of girling a large ratio of reduction in a



### **Electric Trucks for Every Service**

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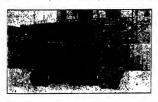
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single step-all qualities that are of th utmost importance in automobile engi-neering. By dint of the application of ethods the worm was brought to a state of efficiency that even now is no altogether credited in some cases, and it has been applied to the driving of mas of widely varying capacities-from the lightest to the heaviest, in fact. While the worm commonly is designed for a live the worm commonly is designed for a live-axle drive, as is the bevel gear drive, there are machines both in Europe and in this country in which the rear wheels are driven each by a separate worm. Shafte extend along the sides of the car to housings which inclose the worms, worm sings which inclose the worms, worm rs and the wheel bearings, which are of unusually heavy and accurately fi construction so as to maintain the relative positions of the worm and the worm As in the case of the bevel gear drive, it is of extreme importance that the worm and worm gear should be very rigid supported so as to prevent relative of greater moment in worm gearing than in any other form of power trans for the stightest inaccuracy of alignm necessarily results in an enormous in crease of friction; and lubrication, copi and unfailing, is absolutely e to the worm, which operates wholly with to the worm, which operates wholly with a stiding action and depends upon accur-ncy and smoothness of finish of its sur-faces and upon their separation by a film of lubricant for its efficiency—assuming course, proper design in the first pince

Worms are used in both overhung and nderhung forms—that is, either above or below the axie The usual reason underhanging the worm is to insure lubrin, and in overlianging the road clear ance under the axle is increased.

The least common final drive is that in which the rear wheels run on a dead axle and are driven by spur gearing, the wheelhig with the gears, being carried on th ends of a countershaft which is mounte close to the rear axle. Drive to the countershaft is effected by bevel gears, as in the case of side chain drive. It is usual to house the entire drive system, including the gears on the road wheels, for protection and for the furtherance of lubricaare employed in this type of drive, though the internal spur is the most commonly used. By placing the countershaft directly over the axle and providing the ends with universal joints turning on the same axis ring knuckles, this drive can b employed for wheels that also are steer lug wheels, and this has been succes done in a number of instances where it has been desired to drive through the front or through all four wheels

#### The Motor Truck and the Freight Terminal

esting sugge Robert L. Niles, published in the SCIENTIFIC AMERICAN of September 27th under the above heading, were accompanied by a tentative local sotution of the problem. This solution, which was omitted at the time because of limits of space, is

Each city terminat presents its own em, though solution fottows genera

the city of New York an average of 7.000 freight cars arrive and depart daily The majority of such tonnage is handled by the following railway systems: Baltimore and Ohlo, Eric, New York and Har-lem, Central of New Jersey, Long Island, New York, New Haven and Hartford, Del-aware, Lackawanna and Western, New York Central and Hudson River Railroad, Pennsylvania Railroad. With the completion of the Hell Gate

bridge, all such roads will, or readily might, be inter-connected, and with all but ss area and trackage surrounded by sap real estate, and close to the easter. ends of both the Williamsburg and Queensboro bridges.

At the present time the freight trans-fers of the Baltimere and Ohio are at Cummunipaw or by lighter to various New

That of the Central Rat erbey the same. That of the Erie at Jersey City

similar transfer over wat That of the Delaware, Lackswan Western at Hoboken or by water to

fer to sundry piers.

That of the Long Island at Astoria

Long Island City.

That of the New York Central and Hubson River Ralirond at Sixty-sixth Street, St. John's Park and vasious piers on the North River. The Harland with the New York Central.

That of the New York, New Haven and Hartford Railroad at 138th Street, and float to various East River plers.

That of the Pennsylvania at Jersey City,

at Astoria, Long Island City, and by wa ter transfer to various down town, Non

th of such points of distrib restricted in area and accessibility, cost-ly to maintain, and in many cases abse-lutely impossible of expansion and in every case only extensible at enormous every case only extensible at enor

In its infancy it is impossible to decide upon details of installation and equipent, but it can be seen that costly ment, but it can be seen that costy mis-takes could hardly be made, that original equipment could hardly be valueless, that growth could be along the lines of experiance and added equipment such as actual operation indicated, without discarding any previously scenired, and that profitable operation should follow even modbeginnings with the possibility of limit-less growth and, through experience thus gained, lead to the installation of similar systems in other centers of distribution. The field of operation is limited only by the combined tounage of the entire tr portation methods of the country, and the um total of the congested terminals

#### Are Men Better Typists Than Women?

luded from page 316.)

with their disks, or weights. Two of the buckets are made of aiuminium and weigh 1 gramme (15.4 grains) each; the others gramme (104 grams) such, the others are of copper and weigh 10, 100 and 1,000 grammes (about 1/3 ounce, 3 1/2 ounces and 35 ounces). The disks of each series are 10 in number and range from 1 to 10 units in weight, the unit representing 1/10. 1/100 or 1/1,000 the weight of the ard bucket. The subject is blindfolded and seated in a comfortable position at a table. The examiner gently suspends the standard bucket of 100 grammes weight from the second joint of the subject's index finger, where it is left hanging for 5 seconds, and is thrice "hefted" by raising and is replaced, 3 seconds later, by the other 100-gramme bucket, loaded with an additional weight of 9 grammes. The subject is asked which bucket is the heavier. experiment is repeated, with progre sively increasing overweights, until the question is always answered correctly. The limit of muscular sensibility is exed by the ratio of the added to the weight of the standard bucket.

The essential feature of the d'Arsonval core (Fig. 4), employed in measuring the auditory reaction time, is a clock with a single hand or pointer, which makes one complete revolution in each second, in front of a dial divided into hundredths. A Foucault regulator (rot-ary fan or "fly") assures constant speed for about ten minutes. An axis made in two parts, of which one is permanently connected with the clock train, and carries a feited disk which can be caused to engage with a toothed disk on the other part of the axis, transmits the movement to the pointer. Behing the toothed disk. which is made of soft from is an ele which is made of soft front, is an electro-magnet which draws the toothed disk away from the felted disk and keeps the pointer motionless while the current is passing. When the circuit is broken the toothed disk, no longer attracted by the magnet, is present against the robusting felted sink by a senine and the pointing moves over the disk.

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In measuring the auditory reaction-time with this chronoscope M. Lahy seats himself opposite the subject and holds in his hand an exciter (Fig. 5), which serves to produce a sound by striking a gong and at the same time opens the circuit of the

electromagnet.

The subject, with face averted and eyes bandaged, holds in his hand a little appa ratus, by pressing which he closes the circuit the instant he hears the sound. Th reaction-time, or the interval between the emission and the perception of the sound, is measured by the space traversed by th r on the dial, which can be read to 1/100 or 1/200 second.

In the final test the relative strength of the right and left hands is determined by the right and left hands is determined by means of the Réguler-Chéron dynamom-eter (Fig. 2). This instrument contains a spring which is compressed with the hand, but the pain produced by the rigid-ity of the spring inhibits muscular effort.

Moreover, the dynamometer take Moreover, the dynamometer takes no account of the very important factor of rapidity in muscular contraction. Hence, its indications are of doubtful value, but the results obtained by Lahy appear to prove that persons having hands of equal strength produce the best work on the typewriter.

Let us now examine the psycho-physical indications of excellence in the typewriting art, as they are given in the tables published in M. Lahy's description of his experiments. One fact is apparent at a glance. Although the results ob tained from men and women exhibit a general similarity they are not identical in detail. All good typists show the same marks of superiority, but the psycho-physiological differences between the mer and the women make it necessary to study their performances separately, and then to compare the two series of results thus ob-tained. If the men and women are listed together, in the order of excellence in various respects, the highest places will be occupied by men in some of the lists

be occupied by men in some of the lists and by women in others. Good women typists usually exhibit a marked development of tactile and muscu-lar sensibility, and an excellent memory for letters and especially for concrete phrases. The right and left hands are nearly equal in strength and their atten-tion is keen and well sustained. Their relative slowness of auditory reaction is a theoretical defect, but the value of a typist depends rather upon a combination of good points than upon a great superlority in one particular.

Men exhibit greater uniformity tha Men exhibit greater uniformity than women, but the differences between good and poor typista are nevertheless well marked. In general, men surpass women in rapidity of auditory action and, consequently, in speed of work, but are inferior to women, perhaps, in power of sustained attention.

These conclusions, however, are based upon too small a number of observations to allow them to be affirmed positively and with conviction. The results here given are merely indications which may be con firmed or invalidated by future resea

#### The Work of Aircraft in the French Maneuvers

(Concluded from page \$22.)

teenth army corps, a colonial division, and a provisional brigade of cavalry, was comshanded by Gen. Pau, while the southern army was led by Gen. Chomer, who had under his orders the sixteenth and seventeenth army corps and the sixth cavalry division. Altogether some 70,000 mes division. Altogether some 70,000 men were engaged in the comparatively flat sountry bordering the Garonne. Gen. Joffre's headquarters were established at Castelsarrasin on the Garonne canal. The northern, or Hine, force under Gen. Pan. northern, or Blue, force under Gen. Pan had three sendrilles of aeroplanes stationed at the aviation camp near Agen, comprising six Bieriot monoplanes, six Henry Farman, and six Maurice Farman hiplanes. The Red army's seroplanes, citationed at Toulouse, were six Voidsoind six Bréguet hiplanes and six Department, and the six Bréguet hiplanes and six Department.



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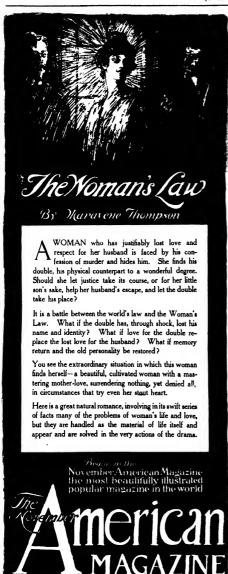
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idea: "Both armies have been engaged ities: "Both armise have been engaged on the north bank of the Garonns; the Southerners have been driven back and the Northerners compelled to hait to collect and supply their forces. The Southern army having been reinforced again seeks action, and the Northern force endeavors to cut the seesary's communications running southward from Tuclouss." The systems of march adopted by the two armises is of interest; Gen. Pan sent forward the colories division as a general adward his colonial division as a general ad-vanced guard, behind whose protection his masses meneuvered in deep columns; Gen. Chomer, on the other hand, adopted the German plan of marching his whole force in parallel columns of equal strength, each orising a division, or four columns in all? The front thus covered by the South ern army—some thirty miles—was nearly double the frontage of the Northern. The first period of the maneuvers closed on evening of the 13th of September with a hard day's fighting, which, however, owing largely no doubt to the numerical equality of the two forces, left the issue undecided. The object of the Northern army was to deliver a crushing blow upon the adversary while it was still shaken by previous reverses, and before reinforce-ments could reach it from Cette and Tou-In the fighting which ensued Gen Pan was successful on his left, but his

On that date the Northern army, com d by Gen. Pau, was declared to be so far victorious that it had pressed back the enemy toward Toulouse, but Gen. Chomer's force had been able to excape actual disaster. On the evening of this day the Northern army held the left bank of the Gimone as far as Aubiet and Auch while the Southerners were in occupation of the high ground between the Gimone The 14th (Sunday) was more or less a day of rest, and there was not very much doing in the early part of the 15th, as operations were to take place that night. At 5 P. M. the Northern force began to move forward, the Gluone was crossed at several points, and the advance diately in contact with the outposts of the Southerners. These, ever, were no more than a screen tended to conceal and cover the withdrawal of Gen. Chomer's troops, who re-tired, when pressed, to a strong position on the Save. The left was the weakest portion of the Southern defense, but the whole generally was so strong that it seemed unlikely that the defenders could seemed univery that the defenders could be evicted in a single day's fighting. This proved to be the case; there was fighting throughout the 16th, and the maneuvers did not end until the following day. Gen. Chomer made the best defense possible be fore entering upon the inevitable retr and his attempt to cover this by attacking Gen. Pau's left was partially successful.

In the course of the maneuvers the

Northern commander made some interest-ing and suggestive remarks respecting his aeroplanes. He addressed himself to the pilots and observers of all ranks, than them for the excellent service they had so far rendered, and demanded great eff so as to ascertain the dispusitions of the Southern army before dark. (It turned out that these dispositions were not obable, because the enemy walted till dark before moving important forces,) While praising the brilliant performances of the gallant airmen, and the excellence of the material, which had worked throughout the maneuvers without an ac cident, the Northern commander said that a yet far more difficult task remained for new arm in maintaining the "liaison" between neighboring army corps and divisions in the same army, and in keeping the commanding general informed of the progress and condition of his own troops.

The difficulty of inter-communication between the various components of a field force of large dimensions when engaged with an enemy in other than very open country and the desirability of using aircountry and the description of using ac-craft for these purposes, as auxiliary to other methods of conveying orders and in-formation, have been emphasized by the French maneuvers and configured by later exercises in England.



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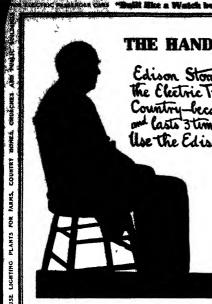
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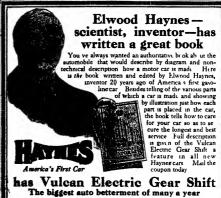
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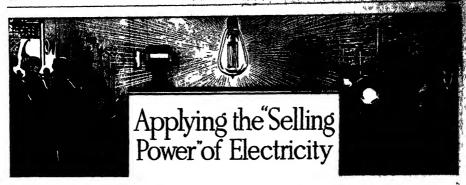
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'Another thing there are a thousand and one electrical devices—there's a good dozen for us anyway-that will transform our ways of doing business, put snap in it, make it smoother and more comfortable for the customers and ourselves be able to do a lot more work with the same people - and it's simply a matter

of plain cause and effect that we'll forge ahead. We'll keep all our good traditions—and make some

This young man who had been "around the country looking at the livest places" held a conference with his architect, then called in an electrical engi-He knew what he wanted done and wanted to learn how he was going to do it. This was a little over a year ago. Today that department store is doing 85% more business than it was doing on the day the new owner made his declaration, with only a 12% increase in its force, and has taken the lead in the volume of sales

Maybe you who read this have retail selling problems that make it worth your while seriously to consider the kind of service you can get from electricity -the kind of service you can get from your outfit and your people with electricity to help

Good light not only means more customers and more sales, but it means greater economy Good light means more sales in all parts of the store—dark, unprofitable corners are banished-it means more frequent turning over of stock-more profit,

Good air means good working conditions, more productiveness for each human unit, and it means agreeable conditions that affect the customer happily in conjunction with the cheery power of good lights

How these great advantages may be carried out in your case is a matter for the electrical man to lay be-You will be astonished at the ease and the economy with which modern outfits can be installed and operated

> Take up the matter today with your electric power and light company, or any General Electric Company dealer or agent in your vicinity You will find them more than glad to co-operate with you, and no matter how complex your problem may be they have at their command the service of any part of our organization that may be most helpful to them and to you.



#### ELECTRIC COMPANY

Atlanta, Ga Bal n or Md Birm ngham Ala Bo se Idaho Boston, Mass Buffalo N Y

Largest Electrical Manufacture

in the World



# SCENTIFICANERICAN

#### THE WEEKLY JOURNAL OF PRACTICAL INFORMATION

WILLIAM SEC ]

NEW YORK, NOVEMBER 1, 1913.

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## SCIENTIFIC AMERICAN

NEW YORK, SATURDAY, NOVEMBER 1, 1913 Unblished by Munn & Co., Incorporated. Charles Allen Munn, Preside Frederick Converse Beach, Secretary and Treasurer all at 80 Broad way. New York

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Munn & Co., Inc., 361 Broadway, New York The Editor is always giad to receive for examination illustrated articles on subsects of timely interest. If the photographs are store, the articles short, and the facts cutilisate, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

The purpose of this journal is to record accurately, simply, and interestingly, the world's progress in solen tifle knowledge and industrial achievement.

#### A Standard or Safe Railroad Travel

HE recent recurrence of futal disasters on our relations has once more raised the ques-tion of the relative safety of railway travel in this country and abroad. In looking for some stand-ard by which to determine whether accidents are more frequent than they should be, it is perfectly fair to take the best results that have been obtained on some well-known system of operation. So for this nurpose, well-kinown system of operation. So for this implose, let us consider the official statistics jumblished by the littlish Board of Trude, which show that during the ten-year period ending in 1000, on all the railroads of Great Britain and Ireland only one passenger was killed for every 72,000,000 carried, which is a rate of cosmalthat must certainly be considered as highly satis-Inctory

With this as a standard, we turn to the last availwith this as a seminary and the Interstate Commerce Commission, which shows that 198 passengers were ed during the year 1910 on the steam railways the United States, during which year the total number of passengers curried was 971,683,199. This means that in that one year one passenger was killed for each 4,900,000 passengers carried Comparing these figures with the standard of safety set by Great Britain, we find that the rate of casualty in that country is less than one fourteenth as great as that in the United Stutes

In commenting upon these facts, Engineering Neur answers the objection which may be raised to the above comparison on the ground that the average length of a rallway journey is much greater here than in Great Britalo, by stating that the British statistics do not include journeys by holders of senson tickets, and that this class of travel covers a very large proportion of the short distance traffic. Assuming, says this authority, that the average of a passenger journey in Great Britain is only one third as long as that in the United States, there still remains an average casualty rate in the luited States nearly five times as great as that Great Brituin

For main years the Scientific American has drawn attention to such facts as those, and we have pointed out from these to that that the remarkable immunity from accidents in Great Britain is rendered the more remarkable by the fact that the density of traffic is much greater on the railroads of that country than it is on our own. It will be news to many of our renders to learn that on the 25,000 miles of steam reliways in Great British and Ireland more passengers are entried per manual than on the 250,000 miles of rultroad in the nited States Furthermore foggy and misty weather, which renders it difficult to observe signals, is for more

prevalent in Great Biltain than here
The admirable safety of British railway travel is due to two causes: First, the practically universal use of the absolute block signal system, secondly, the absointo obedience to that system required of the engine-men. Sintistles show that as far back as 1881, five sixths of the double-track rallway in Great Britale was equipped with block signals and that in 1804, 30.6 per cent was so conjused. The British enginemen has t operating under the block system practically all his life; and he obeys its mandate. When the semaphore ain says stop, he stops, nor does he open the throttle mutil the arm has failen. In this country we play fastand-loose with our signal systems; on many roads, on most roads, in fact, the enginement after stopping at a signal which is afgainst him, is allowed to proceed cautionsly, feeling his way to the obstruction ahead of him This tampering with the block signal system (we call it nothing less) is shown, furthermore, in the continuance of the inefficient and dangerous practice of leack-flagging.

Railway travei in this country can be made as safe as it is anywhere in the world by installing the block system on every road, and by revising our rules of oper-ation so that the signal indications shall be absolutely obeyed. Furthermore, in view of the fact that discipline has not yet reached the high standard which, alone, can render the best mechanical appliances fully efficient, the automatic stop should be in effective preventive of disregard of signals.

#### Magnitude of the New Subway System

OT many people realize the magnitude of the work which is being done in extending the sub-way system of New York. So quietly and unthously is the new method of excuration being carried on, that the residents of New York are not confronted by any physical evidences of the really great magnitude of the medertaking, such as marked the construction of the first subway. Yet it is a fact that the building of what is known as the Duni System involves an expenditure of capital that is over one half as as that which has been invested in the Panama i. The canal, when completed, will have cost about \$375,000,000; it will cost \$200,000,000 to construct the new city-owned aubways.

The latest reports of the engineers of the Public Service Commission show that there is now under contract \$83,000,000 worth of work on the new subway, and that the average daily force employed is 7,000 men. About two fiths, therefore, of this great work is alread; under way. Before the end of the year con-tracts to the value of about \$60,000,000 will have been let, which means that nine months after the signing of the Dual System operating contract, actual construction work will be in progress on three quarters of the

The total length of the new system will be about ighty calles, of which forty-five miles will form an extension of the present interborough system and thirexcusion to the present interpropagate system and thir-ty-five milies will represent the New York Municipal system. These figures, however, cover merely the length of the road; and since the subway will consist of two three- and four-track lines, the shugh-track mileage will be not far short of 200 miles

#### Radio-telegraphy and Safety at Sea

IIE fact that the burning steamer "Volturno" was able to summon to its aid by radio in sages no less than eleven steamers, gave addisuges no tess than eleven steamers, gave additional proof of the priceless value of this means of communication in the saving of life at sea. Not that any such further proof was necessary; for Marcon's great invention had already established its position as one of the most merciful aids to fire saving of immun life. in all the history of invention

It was inevitable that radio-telegraphy should hold s prominent part in the discussions of the Internstional Conference on Safety at Sea, which is to be held in London, on Navember 12th of this year, and we note that Secretary of Commerce Redfletd's committee on this subject has sent in a reco ce, which appears to cover the subject comprehen-

The committee proposes that efficient apparatus radio communication be required on all ships in foreign trade which carry fifty persons or more (passen-gers or crew, or both combined), navigating the ocean between ports more than 200 nautical mil one another; and that apparatus, to be deemed efficient, must transmit messages with sufficient power to be received by day over sea, at a distance of at least 100 nantical miles, by a ship equipped with apparatus equal to that of the transmitting ship. It is further second ended that an auxiliary power supply should be provided, independent of the vessel's main electric power plant, which will canble the sending set for st ast four hours to send messages over a distance of at least 100 mantical miles by day.

There is an echo of the "Timple" disaster to the recommendation that two first-grade operators should be required on all such ships maintaining a constant service, also on all such ships carrying 100 or more passengers; that one first-grade and another first or second-grade operator should be required on all other such passenger ships, and that one operator (first or second grade) and one cargo operator or watcher ab be required on all such cargo boats.

#### Chimerical Weather Forecasting

HERE has recently been a marked recrudencease of the unorthodox weather prophet. Though that the unorthodox weather prophet. Though the unorthodox of the land, his activities fluctuate under the influence of several factors, one of which is the amount of advertising he receives through the efforts of scientific people to discourage bim.

one present case he seems to here. In house cleaning is the Westler. In too, for an indication that the mails service has been product the mails service has been profe that the time has come for the question for have his iunings; or it may be that his presen is merely the usual reaction of an atmorphis miss; is any strong impression of the involves, the impression in this instance being that produced by the instance ate notoriety given a few months ago to Weather for reau affairs. However this may be, an unpresidents number of more or less fautastic schemes for predicting the weather of to-morrow, next week, and next year the weather of to-morrow, next week, and next; year have lately come to light, so that it seems threely so say a word on the general subject of unselessible weather furcesting—with the premise that we are dealing not so much with "falses" as with delaisons, though the former have figured largely in the history of this subject.

A weather prophet's confidence in himself is always in inverse proportion to his knowledge of the laws atmosphere. The intelligent meteorologist is the st modest of forecasters, for he realisses more keesing in supone clear the other conditions with which he has to deal, and the extent to conclusions are likely to be vitiat known factors in the problem. His facilities have been much improved in recent years by the broadening of the weather map, on which alone rational predictions can be based. At Washington a map is drawn every ruing showing the meteorological conditions, reported anorming snowing the meteorological conditions, reported by telegraph, at a chain of stations extending around the globe. With the skil of this map predictions are now made, in very general terms, for a week in ad-vance. Nevertheless, scientific weather forecasting in still an unsatisfactory process, so far as it relates to the ordinary fluctuations of heat and cold, rain and sunshine, though it fully justifies its existence when it comes to deal with such definite and momen currences as storms and cold waves.

The undentable imperfections of legitimate forecast-ing encourage the activities of the charlatan and the ing encourage the activities of the charletan and the crunt. Thought the latter may be an hooset incoranus, there is usually enough method in his mediones to entitle him to find a incretit market for his prognosti-carious. He is supported by the same public which eartheast the publishers of grossly unacholarity lexico-graphical works, obsolute attasses, and the like, and his hippilest hunting ground is the United States of America. It is said that certain promosticators earn incomes of from five to ten thousand dollars a year by the sale of their predictions to newspapers and almanace. Most of these predictions are of the 'longrange" variety; i. e., they are made up for a year or more in advan

In the typical case, the prophet (when he is not a deliberate fraud) is a man who has not sufficient in-tellectual stamina to pursue the long and rugged road tellectual stamina in jursue the long and ranged road of scientific investigation, but who functions that by a peculiar dispensation of Providence he has hit upon a short-cut to the truth. Moreover, the particular mare's nest discovered by one of these persons has tunually been discovered by a great many others; so that the "systems" of the pseudos-destrift forecasters fall into a few well-defined clauses. By far the most numerous aroun of promoticators ascribe supreme influence in meteurological matters to the moon. Another group stakes its reputation on unmpots. Some years ago the hypothetical planet "Vulcan" was a favoribe with these seers. Others exploit that perennial refuse of ignor

seen. Others exploit that percentain refuge of ignor-ance—electricity. And so co.

The reputation of the forecasters—perhaps even of the scientific once—with the mass of humanity is saved by the fact that, with our changeable, waster, even the wildest predictions must frequently hit the mark. Moreover, if a change in the weather predicted for to-day falls to materialize it is likely, in the ordinary course of hasture, to come to-morrow, and the sulght delay in the verification of the forecast is apt to be viewed indulemently by the pusher by

dealy at the vertices of the forecast is app to or viewed indulgently by the public. Weather forecasting has a private commercial enter-prise is, on the whole, more incritive and dignified than, fortune-telling, and does not, as yet, come within the purview of police and post office inquisition

Propolis for Sargical Desatings.—The resignant exhibitance collected by beas from the buds of trees and used by them to stop up crevious in the lives, has just received a newl application in surgery, according to \$1 Headwiden. When this viscous substance is distilled in the wards state there is obtained a brownish liquid of uncolous state there is obtained a brownish liquid of uncolous characteristic income as propolition. When this is opposed with a contract of the state of the st STORY BASE VERY TO THE STORY

Manufacturering.

White Miteriers Lais. The formulas of Mirafores in signs October Ist, when a buildined was placed use the drainings of twe' in the spillway dam. It is exceed that the fall with the full to the test of the spilly dam on November 8th, and to the normal operative of 85 feet shows the east by December 8th. Should be deathed to fill the laise carlier, the water may be swyn from the high level of the Gestun Lake and letters out through the outvot of Pedro Miguel looks.

Checostic as a Panearvative of Telegraph Peles.—It is estimated by the Canadian authorities that every year some 600,000 telegraph and esleptone poles have to hergidated because of their decay. Universide red coder poles has fire \$0 junet; if the eronocies is put on by the himsh-they last 18 years; if they are task-dispect hergins 20 years. Walte coder has a fire respectively of 14, 17 and 22 years, according to the treatment, and yellow place 10 years. It is estimated that recibiodes treatment would save upward of 200,000 poles

Recreased Use of Locametive Superheaters.—There was recently held at Cassel-Wilhelmshöbe a celebration to commensurate the equipment of the 25,000th locametive with the Schmidt system of superheating, which has now become a standard and increasingly popular has now pecome a standard and increasingly popular feature of Locemotive practice. Dr. Schmidt's first superbaster to be applied to locomotives was installed in 1898 on some origines of the Prussian State Railways. Schmidt's pioneer work and its nucesses encouraged com-petition. By 1910 some 5,000 engines had been outpiped; 10,000 by 1911, and 30,000 in January, 1913. To-dily the figure stands at 25,000.

The English Channel Tunn The Baglish Channel Tunnel.—The recent conference on Franco-British traffic has further stimulated the awakanad interest in the proposed tunnel beneath the Strate of Dover. It is proposed to build for parallel tinnels, which will vary from a straight line in order to remain all the way in the impervious gray chalk. The landing points will be to the west of Colais and to the west of Dover. On the Presch side, connection will be made with the Chemin de fer du Nord, and with the Stuff Eastern Line in England. Drainage hosdings will be run from the lowest point in the center of the tunnels to the shore on either side. Parlament is shortly to be asked to sanction the undertaking.

Traffic Over the Forth Bridge.—In the first year of operation of the Forth Bridge, from March, 1990, to March, 1991, there erossed over the Forth Bridge 37,610 trains of a total weight of 9,941,612 tons. In the year March, 1913, there crossed the bridge, 62,944 of a total weight of y,941,012 form. In the year charce, 1912, to March, 1913, there crossed the bridge, 20,944 trains, an increase of 40 per cent, while the total weight increased to 15,584,410 tons or about 60 per cent. This bridge still remains the largest of its kind in the world. It has two spans of 1,710 feet each, the next longest span It has two spans or 1,10 feet each, the next longwar gas-being that of the Brooklyn Bridge, which is 1,595 feet, while the Williamsburg Bridge measures 1,600 feet between towers. Those two last named are suspension bridges and the Forth Bridge is a cantilever structure.

The Largest Wood-stave Pipe.—The Northwestern Electric Company of Portland, Oregon, has recently built for the conveyance of water what is, so far as we know, the largest wood-stave pipe yet constructed. It is 13½ feet in diameter, one mile in length, and it serves as the flow line from the dam to forebay. Acserves as the flow line from the dam to forebay. According to details given in the Següerene, Neue, there are ninety-four 4-inch staves around the circumference, the commal length of which is 18 feet. The construction of the pipe salled for over 1,500,000 feet is the ropport, 475,000 feet in the credit soid 210,000 in the mud sills. The staves were laid without tongue or grover, there being a steed down plant in one and of each stave to make tight the butt joints. The pipe was laid upon a bed of solid ground and, to stiffen it against distortion, it was earnied in supporting credies which were speace four and 'then half feet apart on tangents, the saddless being carefully cut to shape.

the anddies being carefully out to shape.

Resignised to the Second Claim.—The recent statement in the delty press to the sifect that the North German Lloyd Steamable Company is about to patter the "Kaiser Whilehim des Grosses" Front its express service, and that it will rename the vessed and robuild it for ecound and their date and storage treits, removing the first cabin accommodations sitegasher, serves, to resind us how the transatilatuit figure of one decode become the second class ships of a later day not far removed. Transatiantic services will result the time when this favored ship make her first opposyncies, and by overeing the passing at an Average rate of 22½ inchies an hour, received the so-called "blau ribbon of the Alabette" losses the "Leanable" of the Cusard Line, which land raised—the vessed to 22.51 knobs syctosy for the "links, legs. A slighter reconstruction and resinglifement of the cusardiant, "so there recons" before, these tensors are supported to or three years are, when the 225-facing "Resinguistics".

#### Electricity

Etiession of the Pensnytymia Railroad Electrical Zess.—15 has been announced that the Pennsylvania Railroad will extend it electrified zone to Blizabeth, N. J. This is a step toward the electrification of the entire New York division, which will probably be ac-complished within the next few years.

Wired Dwellings for Rent.—An enterprising electric light company in Muncle, Indiana, is advertising houses for rent which are wired for electrical con-veniences, the idea being to keep wired property oc-cupied, which of course is to the interest of the company that supplies electric light and power. Another objet is to induce owners of property to wire their houses.

The Emergency Force or B wire tear nouse.

The Emergency Force or B allidaya.—The electric light company of Marion, Indiana, has experienced considerable difficulty in securing a force of repairment or re-establish service interrupted on Rundaya and holidays. The difficulty has now been overcome by requiring the repairment to telephone to the central station their whereabouts as soon as a storm break out. In ease of any interruption, the manager may then collect a sufficient crow of repairmen in a very few minutes.

Electric Locomotive for the Canadian Northern Electric Locemotive for the Canadian Northers Railway.—Orders have just been placed for seven loo-motives and eight multiple unit motor car equipments for the Canadian Northern Railway terminal in Montreal. The locomotives and motor ears will use direct current at 2,400 volts. They will be equipped with two commutating pole machines in series with 1,200 volts across each motor. Electrical energy for operating the locomotives and motor cars will be received in the form of 3-phase, 60-cycle, 11,000-volt current, which will be transformed by motor reservator sets to 2,400 volts. transformed by motor generator sets to 2,400 volts direct current. Each locomotive will weigh 80 tons.

Ossaissed Chicks.—A poultry man of Waltham, Mass, says the Electrical World, is using electric consisters to reduce mortality in the hatching and broading of chicks. Ordinarily 24 to 40 hours clapsed from the time the first chick peeps forth from its shell until the last one appears. But the use of cone interests at the chickes, included they are contracted to the cone of the unus une sat one appears. But the use of ozone in-vigorates the chicks as indicated by a recent hatching which came out in ton hours. Furthermore, the chickens are uncommonly strong and robust. Experiments are now being extended to purify the hen-poisoned ground ders in an attempt to save a portion of the t mortality which occurs after the young cens are batched.

Searchlight on an Observation Tower, .-The "Fast ail" leaving St. Paul and Minneapolis every evening for Chicago carries a search lamp on the observation platform of the last car. This illuminates the landscape along the line which parallels the Mississippi River for over a hundred miles, and gives the passengers a very pleasing outlook. The search lamp is used on the 60-volt train lighting circuit and takes 20 amperes. The electrodes are placed horizontally, and after being focused they are kept in adjustment automatically. The lantern which is 13 inches in diameter stands on a pedestal about four feet high, and takes up 16 square inches of the floor space of the observation platform.

Passing of the Belt.—In a paper road before the American Institute of Electrical Engineers at Phila-delphia, Charles Fair discussed the passing of the belt, and showed how that most dangerous piece of mechand showed now that most cangerous piece of meca-nism in the factory is being displaced by the individual motor mounted on the machine. In considering the improvement brought about by the electric motor in the factory one should credit it not only with a great saving in power, but also with a great reduction of injuries asving in power, not also with a great reduction of injure to employees. Although America was the pione in motor-driven machinery, it seems that Germany showing more progress in this line. Nearly all machin in Germany are now direct motor driven.

The P. A. Y. E. Car la England.—At a recount conference of the Municipal Transvays Association at Shuffield, England, a paper was read on "hay-as-you-cuter" cars. Referring to this paper editorially, the Biscircian (London) asya: "The policy of the American transway authorities is to look upon every passenger as a thief, and every conduster as a thief until the contrary is proved. Thus it comes shout that many ingenious methods have been devised in the United States for rendering absolute the certainty that every passenger shall pay his face, and every conductor shall turn in all the money be collecta." However, after thus supercilinesty referring to American practice, it adjults a that the experience with ears of this type at Leignstein he. been againstancy, which would indicate that the American policy is not so bed after all, also that British conductors and Leveling public are not all overseroguidness in first dealings with the public service expension. There are some objections, however, to The P. A. Y. E. Car in England .- At a recent conover-scriptions in their cleanings with the panne service scriptions. however, to the use of P. A. T. E. case in Great Britain, owing to the complication of their film system. In Glasgow, for instance, there is not route where the farce range from 1/41 to 71/41, and there are 47 overlapping 1/41.

#### Aeronautics

This Airship Can Pick Up Its Stores. - In patent No. 1,070,197, to Charles Scott Snell, of London, England, an airship is provided with a grapple device suitably connected to a winding apparatus carried by the air-ship and a suitable carrier for a load, all so arranged that the load can be picked up by the airship during its flight without severe shock

Launching a Parachute by Power - Dinnel W Adams, of Glendale Springs, N C, has secured patent No. 1,069,662, in which a parachute has a tubular stem which forms an outer shell and is adapted to serve as a motor cylinder A source of motive power is connected with the interior of the tubular stem and controlled in order to launch the parachute safely.

American Aerodynamic Experts to Study Abroad.

Assistant Naval Constructor Jerome C Hunsaker,
U. S. A., and Prof. Zahm of the Smithsoman Institution, formerly connected with the Catholic University at Washington, will soon go abroad with a view to inve gating recent foreign developments in aviation Hunsaker has been detailed for duty at Boston pre-paratory to his assuming charge of an aviation course

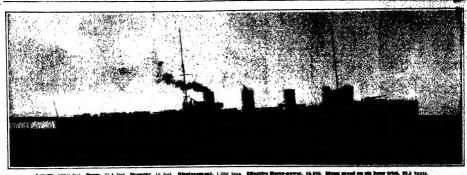
A Parachute Attachment for Aeropianes. Joseph \ Steinmetz of Philadelphia, Pa., has patented, No. 1,007,-559, an aeroplane which has a transverse frame to which the planes are fixed and a frame transverse to the first frame with a parachute stowed at substantially the intersection of the two frame members and connected rs and connected by tension devices with the ends of the frame members. The parachute is liberated by means under the control of the operator

An Aeroplane Stabilizer. - Henry C. Fisk of Stafford. An Aeropiane Stabilizer.—Henry C. Fisk of Stafford, Com., has secured patent No 1,072,710 for stabilizer for scroplanck, in which a stabilizing plane is arranged above the supporting plane and has a central portion surrounded by an upwardly and outwardly extending rim, making the stabilizing plane in the form of a dish with a flat central portion. The patentee claims that experiments have shown that the stabilizer will return acroplane to an even keel no matter what position acroplane is when it is launched in the air, provided the aeroplane is when it is launched in the air, province, the height at which it is launched is sufficient to give the stabilizing plane time to perform its function

Aeroplane Radio Equipment. -The United States Government has been quietly but steadily carrying on a sories of experiments with wireless apparatus on sero-planes. The Signal Curps wireless messages have been sentfrom a height of 1,500 feet and received at a station almost 15 miles away, while other messages have be taken easily from machines 2,500 feet in the air The radio equipment used weighs complete about 75 pounds and has a radius of 30 miles. The electric generator and has a radius of 30 miles. The electric generator is friction driven from the flywheel of the engine and has an output of one eighth of a kilowatt. The antenna is of the hanging type, the wire being would on a reel when

Aeronautical Meteorology in France. -The first meet ing of the commission organized under the auspices of the Meteorological Society of France to study the relations between aeronautics and meteorology was held in Paris May 30th, under the presidency of Col Rénard, and was attended by representatives of the Ministry of War, the Central Meteorological Bureau, and the principal aeronautical clubs of France. The commission voted to publish an account of the sources of meteorological information available for aeronauts, d passed a resolution in favor of the establishment in France of a network of pilot-balloon stations similar to those constituting the aeronautical weather service of Germany

Exploration of New Guinea by Airship. The plans of Lieut P. Gractz for exploring the interior of New Gulnea by means of an airship, brief mention of which has already been made in these columns, have now made material progress, a commutee having been formed in England and Holland to linance the undertaking, which is expected to cost about \$750,000. Designs for the airship have been drawn in Berlin. It will be 320 feet arsing nave occur arriven in Ferrin 1 with constructions by 60 feet in diameter, will be able to rise, under normal conditions, to an altitude of about 12,500 feet, and will make a maximum speed of 34 miles an hour 11 will be equipped with two 100 hose-power motors. The base of the expedition will probably be Main, where a base has been established by the Sepik expedition, now in the field. A portable shed for the airship and a gas-generating plant will be set up at this point. A series of trips will be made from the base, in each case to ome previously selected point on the coast, which can some previously setested point on the coast, when can be reached in one day. Another has station will probably be established for the exploration of Dutch New Guines. As pointed out in Petermanic Mit-teriangen, this project not only gives promise of securing, with the aid of such instruments as the zero camera and and off the photoperspectrograph, more rapid surveys of the interior than are possible by ordinary surveys of the interior time are possible by ordinary methods, but also of furthering ordinary terrostral explorations by saiding in the establishment and provisioning of stations in places now difficult of access.



ngth, S26 9 feet. Bonn, 31.4 feet. Draught, 10 feet Mee mt, 1,280 tons. Effective M of en magnered selle, 87 kg

#### Russian 37-knot destroyer "Novik." the fastest sea-going ve

#### Fastest Vessel in the World

By Our Berlin Correspondent

T HE world's fastest seagoing vessel has recently performed its trial runs cording to German press notices, the Russian torpedo-destroyer "Novik," built in the shityards of Messre Vulcan-Werke, in connection with the official irial on the measured mile, with her trial load, has resolved a puen made of 27 knot, the has reached a mean speed of 37 knots, the maximum speed being 373 knots per hour. Some days afterward, the vessel rwent the continuous six hours' trial ided by contract The speed preprovided by contract scribed for the Irial, viz., 36 knots, was not only reached, but exceeded considerably, a mean speed of 362 knots, throughout the six hours, and a mean speed of 86.8 knots during the last three hours being obtained The englues and bollers, in spite of these high speeds, never were pushed to the limits of their capacity, and no smoke issued from the funnels of the bollers, which were fired exclusively with liquid fuel.

The "Novik" is a turbine-propelled yes sel. The following gives some of her main

Caia:	
Length between perpendiculars	326.9 ft.
Maximum breadth	.31.4 ft
Displacement	1,250 tons
Draught	10 ft
Engine output 36,500 eff 1	torse-power
Contract speed	36 knots

rew . . . . . . . . . . . . . . . . 140 men The "Novik" mounts four 4-inch rapidfire guns and four torpedo-tube sets. She is the only vessel of her class; but Russia is building eight destroyers of 1,050 tons and 24 knots speed

#### The Most Rational Source of Power Tapping the Sun's Radiant Energy Directly

S CIENTISTS have known for many years that mechanical power to any desired amount can be obtained from the rays of the sun, and have measured this power very accurately, but owing to its diffuse nature, its collection for practical

purposes presented very many difficulties. Some seven years ago, Mr Frank Shuman of Philadelphia attacked this prob-lem seriously with a well organized force, and the backing of men of means, and has now in operation at Cairo, Egypt, a very practical and profitable irrigation plant deriving its power entirely from steam generated from water by the rays of the sense that the plant has now been running steadily since June, pumping water at a rate sufficient to irrigate over a thousand acres of land.

The first trials were made on a very The first trius were made on a very small scale. Material after material, idea after idea was tried. By a process of elimination and addition and a gradual increase in the size of the trial plants, a practical method of using sun power was into the problem was thoroughly investi



in power plant as it was set up in Egypt for a test



Sun heat absorber which catch s the sun's rays upon mirrors and concentrates them upon the long boiler in the center.



View showing the irrigation of land by sun power.



Looking into one of the al

gated, and one difficulty after the other being overcome, finally the plant now in successful operation in Egypt resulted.

Sun power plants once course, dispense with all constructed, of se with all fuel, while in order to be practical and commercially profitable, they must conform to the following requires

1. They must not cost so much to construct that the interest on the cost over and above that of a coal burning plant of equal capacity will appul the profit made

y the saving of cost of the fuel.

2. They must be constructed of such material and in such a manner that few repairs are needed, and so that they will st very many years.

S. They must be constructed strong enough to stand the heaviest gales that may occur in the localities where they are erected.

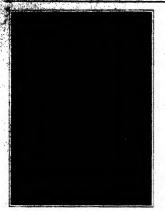
4. They must be sufficiently simple for anyone capable of running an ordinary coal burning plant to be able to run them.

The present Egyptian plant fuffills every one of these requirements. Its cost is kept down to reasonable limits by construction to the cost of the cos structing the entire frame-work of the heat absorbing portion of the plant out of simple structural pieces, all of similar simple structural pieces, set or similar design, and formed quickly and cheaply by ordinary machinery. The mirrors are made of ordinary window glass, silvered and protected in a special way, and cost only 5 cents per square foot. The foundation posts are of concrete and made in place. As far as the engine, pump and auxiliaries are concerned, these are the same as in any good coal hurning steam plant, except that the cylinder of the engine is larger, owing to the fact that low-pressure steam is used. The heat absorb-ers and steam generators are constructed entirely of concrete, steel and glass—all materials which will last for very many veers in the tropics. The iron being easily accessible can be painted every six or eight years. The heat absorbers are all engate years. The heat necorpors are all constructed to stand safely a wind pres-sure of 30 pounds per square foot—more than that caused by any gales occurring in these sortions of the tropics.

The sun power irrigation plant consists of the heat absorbers, five in number; a low-pressure reciprocating condensing steam engine of 100 horse-power, a reciprocating pump, and all the necessary auxil-

As the entire engine and nump portion of the plant is practically identical with those of ordinary coal burning plants, except that the engine is specially invented and constructed so as to run very ecoand constructed so as to run very economically on low-pressure steam (for a description see Schenving American Sur-Flement, July 19th, 1918, p. 29), we will remaint. July 1263, 1918, p. 20), confine ourselves to a description sun heat absorbers and steam gen-which will take the place of the furnace and stack of the coal of

(Concheted on page \$66.)



Ordinary electric lights are not suitable for the application of ultra-violet rays. Specially constructed lamps are designed and eperated for that nurness.



View of an ultra-violet ray apparatus intended for use in sterilising water in a physician's office, an operating room of a hospital, or other places for treatment of patients.



When the human skin is exposed to sunlight the utra-violet rays penetrate and cause a dissociation of some of the chemical substances in the blood and tissues.

## How Inventors Use Ultra-violet Rays

#### Making the Invisible Radiations Do Man's Work

For one were to take a trip 8,000 miles long in perfoct darktees all the way except for a distance of one linch, for which short distance the way was brilliantly lighted, would it be supposed that one would gather a very good dose of the country and scenary traversed? In the innegitary trip one would be under the same and the same traversed of the country of the same traversed of the country of the same traversed of the country of the same traversed of the country and country traversed to the same traverse practically all observations of physical phenomena have been made by visible light the proposed of the other, the medium in which light he proposed of the other, the medium in which light he proposed of the other, the medium in which light he proposed of the other of the country of the same traverse of the country of the same traverse of the same traverse

In the appended table is seen a diagram of wavelengths and the phenomena with which they are most commonly associated.

Cheen active

Ch

Now as indicated on the diagram, the upper rays of longer wave length are beat waves, and the lower ones of shorter wave length are chemically active rays. These shorter rays below violet are known as pitraviolet or chamned rays, and it is with those that we are st prejent inherented.

These shorter may below violet are known as pittriviolet, or chemical rays, and it is with thouse that we are at present interested. The tight from the sun contains all the rays in varicius proportions from the inference instead. (1) on our table. Including the ultra-violet rays marked (1) on our table. The tight higher of the sun on it actions the cards con-

AN MARKAGE LINES AT

tains all these rays. It is altogether possible and most likely that the sun gives all these various redistions and possibly others, but it is not possible to determine this as a fact for the waves may be of such slight intensity that they do not reach us in sufficient quantity to be admessible. Ultra-violet rays are very quickly absorbed by the atmospheric gases, and it is only a comparatively small part of the ultra-violet light that is given off by the sun that ever reaches the earths arriace, but the rays that do reach the earth play a very important part in the welfare of the biological inhabitants of the earth.

One fact determined when the properties of uitra-



Ultra-violet ray electrode designed by Dr. Charles



ipores of Nosema bemberis (silk worm). Photo

violet rays were first investigated was that the ultraviolet rays have a stimulating effect on plant and animal life, and as early as 1500 an experimental hothous, using windows of bits and the same than the same than the same to determine the best conditions of the and evolute gissers to determine the best conditions of were to be the same and animals. Although the offers were to this reducery land and filling same are almost controlly onesses of ultra-violet rays. In effect the arrangement merely shut off a servicial per cent of both best rays and ultra-violet rays.

In more recent years the United States Department of Agriculture has carried on very extensive and ex-baustive experiments along the same lines. The results obtained from these experiments brought out the fact that the ultra-violet rays are a stimulus to plants, espe-cially at certain stages of their growth. However, the light does not have the same effect upon all vegetation and in some cases certain plants were greatly aided by the light, and in the same light the growth of others was retarded. The light for these experiments was obtained from mercury vapor and lamps, for the incandescent vapor of mercury is peculiarly rich in ultra-violet rays. In regard to the effect upon plant life in general, the first thing to notice is that ultra-violet rays have a strong chemical effect and are the part of the light of the sun which is very necessary for the life of the plant to enable it to breathe The green the rise of the plant to engoin it to breather. The green chlorophyll in the leaves and growing stress is the chemical substance, which, under the influence of these chemical, actinic or ultra-violet rays, dissociates the carbon dioxide in the atmosphere into its elements carbon and oxygen. The plant absorbs the carbon and the leaves exhale the oxygen Phints in the absence of chemical rays of light soon turn pule, because of their inability to absorb and convert the atmospheric curbon dioxide which is a vital part of their nutriment. At present it is not practical to aid ultra-violet rays arti-Scially since they are costly and difficult to apply. Ultraviolet rays if generated by electric light must be very powerful to be of any effect, as these rays are quickly absorbed by the air, and very little of this form of asserbed by the air, and very fittle of this form of light reaches the plant unless it is near the source, Ordinary mercury are lamps are not suitable as it is difficult for the raps of short wave length to pass through the glass bulb. Specially constructed mercury are lamps with quartz sides are very good for propagaon of waves of short length. But at present such installations to stimulate plant growth are too costly to be of broad commercial value

The effect upon animal life is somewhat different.

The effect upon animal life is somewhat different. Ultra-riolet rays are very deadly to micro-organisms and bacteria. Upon animals of higher order the light seems to have a very beneficial effect as the more highly developed automatically adapt themselves to the light and soon protect themselves from the effects of ultraviolet rays. This is the well known sunburn and tan which is Nature's protection against chemically active light. When the human skin is exposed to ambight the ultra-violet rays penetrate and cause a disacta-tion of some of the chemical substances in the blood and tissues, this causes pain and inflammation. The effect is that a layer of pigment is soon deposited in the skin which acts as a screen to these chemical rays, enting further damage.

Ultra-violet rays are very deadly to all bacterial life and are of especial use in killing off the micro-organ-isms which cause disease. So beside the stimulating effect which sunlight has upon the human body it has a great bactericidal value. Hence, the doctrine of fresh air and sunshine is eminently correct. And sunshine ough a window is not nearly so beneficial as direct sunlight, as these ultra-violet rays have great difficulty in passing through glass. This is very well illustrated by photographs taken by Prof. R. W. Woods of Johns by photographs taken by Prof. M. W. Woods or Joins Hopkins University. In one case a photograph is taken of a doorway with part of the light passing through the glass door and the rest of the light through the unobstructed doorway. In ordinary sunlight the glass door appears perfectly transparent, but when the same view was taken by ultra-violet rays alone, the glass in

door appears porfectly transparent, but when the same view was taken by ultra-violet rays alone, the glass in the door totally obstructed the rays. Medical applications of this principle have been made in the use of ultra-violet rays and X-rays for the treat-ment of certain diseases. The general effect of ultra-violet rays, radium emanations and X-rays is quite similar except that these last rays are far are appear-

violet rays, radium eminations and x-rays is quite similar except that these last rays are far more power-ful in their chemical and penetrative effect, and are in general far too powerful for continuous application. In 1909 Finaen, a l'annish physician, opened his fam-ous tight inettute in Demnark for the treatment of skin diseases by the application of germicidal ultraakin diseases by the application of germicidal utira-violet rays. He used as a source of utira-violet rays, an arc samp of high power. This lamp was inclosed in a cylindrical casing which served somewhat as a reflec-tor. At the bottom end of the cylinder were arranged four tubes which served to direct the rays upon the patient to be treated. Quarit lenses were used to gather and transmit the ultra-violet rays. These tubes were filled with clear water to coot the tubes and to cut out heat rays. Water is quite transparent to ultra-violet rays, but showths het vans receitly. The national volet rays, but absorbs heat rays readily. The patient is placed so that one or more of these tubes can be directed upon the diseased parts and the lower end of ng the quartz crystal is then pre upon the skin of the patient.

upon the skin of the patient.

The ultra-violet rays have not very great penetrative power, and hence, are suitable for treating only skin diseases and superficial infections. But this is advantageous as the underlying tissues are not inflamed. The cases which Fluien treated were mostly cases of inpus. This is a tubercular infection of the skin which acts much like cancer. The skin becomes rough, in d and slowly rots away, leaving small tubercul wart-like projections about the edges of the sore. An-other disease readily cured by ultra-violet rays is psori-lasts, in which the skin becomes scaly and covered with white flakes and which causes intense irritation and itching. Finsen's followers even claim to cure cancer, but this is extremely doubtful, and no authentic proof has been submitted. The application of ultra-violet rays was made in treatments lasting about an hour. It was found that too long continued application inflamed the skin just as exposure to the light of the sun. In effect the inflammation is nothing more than ordinary sunburn

In cases of tong standing disease it was often neces in cases of long standing disease it was often neces-sary to use silver nitrate as a caustic to clean the spot to be treated by the ultra-violet ray. The X-rays were also very useful in cases of deep seated disease as they have so much greater penetration effect than the ultraviolet rave

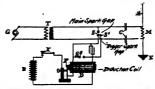
This form of treatment was found to be very effect tive and over 2,000 cases have been treated, of which over 60 per cent were cured. This extensive treat-ment was made possible by State contributions. At first, cases of very long standing and of people of very advanced age, crowded the institutes and the cure of hese was extremely doubtful. By far the most important use of the uttra-violet rays

at present is the use of the light for purposes of sterii izing drinking water. This has reached a high stage of development in France. As early as 1906 Messrs Courment and Nogler began experiments to determine the value of ultra-violet rays in sterilizing liquids by their action. As a stimulus to their activities the city of Marseilles in 1909 authorized an open competitive test of water filters and stertilizers for purifying the

The compensor, which was normany our. The compensor at their own expense a purifying plant capable of furnishing 200 cubic meters = 12.840 gailous of water in twenty-four hours. The appearatus finally adopted was an installation using a rough filter and a sterilizer of the type shown in the accompanying drawing, using a West inghouse-Cooper-Hewittamercury vapor lamp with quartz

tube. The water is run through a cast iron box in the tube. The water is run through, a said troit look in the port which is supposed a questio piecerce; are tunnel to the control of the control off the rave

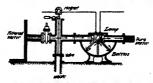
The box lamp is pivotally mounted so as to ellow titting of the tube to start the light. In series relation with the ismp is arranged an electromagnetic centrol of the waste valve as indicated in the drawing. In case the current falls or the lamp goes out, the valve automatically opens and prevents any of the water passing through the apparatus without being sterilised. This is highly important for even a very small amount of unsterlised water passing into the pure water mains would contaminate the entire supply for some sime. With this apparatus it is possible to aterilise 600 cubic With this apparatus it is possible to attentiate 600 within meters (158,800 gations) in twenty-four hours at a cost of about \$10 a million gallons. The water is not altered chemically and the taste and odor is not changed in the least. The importance of this application can hardly be overestimated. In the case of city water supply it is apparent that where this form of apparent



The principle of De Forest's wireless system based on Herts's discovery that ultra-violet rays striking a metal plate ionize the air about it.

is used there is no risk of a wholesale epidemic of typhoid and other fevers. In use for hospitals, hotels barracks, and school buildings this means of sterilization is unsurpassed. In commercial installation, where pure water supply is important, such as breweries, canneries, creameries and prepared food laboratories it

Regarding the effect of the rays upon bacteria the regarding the energy in the rays upon becurs insection has been supposed to be due to formation of ozone, which would then act upon the bacteria, but on the contrary the bacterical action is direct. No osone is formed in the water though the incidence of ultraviolet rays upon the atmosphere causes the formation of ozone. The water thus treated was first tested by feeding to dogs and guines pigs, but no bad effects were produced, and since then, practical use for domestic purposes has proved the water absolutely harmiess. A paculiar fact noted, is, that pathogenic or disease caus-ing germs are killed much more quickly than are the nary harmiess germs. Germs that resist boiling



Courment-Nogier apparatus for use in sterilising water by means of ultra-violet rays.

for a iong time are killed instantly when exposed directly to the influence of the rays. This scheme has been applied as well to sterilizing milk, beer and other liquids, but the apparatus is modified so that a chinner stream is exposed to the rays. All colloidal and sus pended matter cuts off the rays very quickly. The pas sage of the ultra-violet rays through air ionises the latter and forms ozone, which gives the milk a bad tasts, so that it is necessary to pass a current of nitro-gen across the surface of the liquid to shut off the oxygen. This increases the cost above that for sterilised water, but it is triffing.

ised water, but it is triffing.

A However, practical application of this effect is insee in the bleaching of flour. After milling, the flour is all solvely sprinkled down a choice. In this choice is an arc lamp of high power. The onone generated by the ultra-riolet rays from this lamp bleeches the fleier to perfect whiteness. The cost of such treatment is insignificant, and by this means four made of a poor grade of wheat appears as whith as that made

from the highest grade. The flour is the sense and contritive value when so invested that the sense is sense in the part of the sense process of the sense of the arn up, due to the arc caused by making and breaking a heavy high voltage curren

a neary mgn vortage current.

One of the most bold and startling applications of
the use of ultra-violet rays has been made in a study
of minerals, more particularly in determining the elements upon moon, sun and stars. The method pursued is somewhat as follows: A photograph of the moon is taken by ordinary yellow sunlight reflected from the moon's surface, and certain dark apots and other light spots are noted on the surface. Then a photograph is taken by ultra-violet rays alone by means of a quarts taken by ultra-violet rays stone by means or a quartu-lens coated on one side by a thin film of all view screen-ing out all other rays. The contrast is remarkable. Some of those dark spots appear bright and some ap-pear even darker than by yellow sunlight, while some of the bright appear postly dark. This is due to the fact that most substances absorb the ultra-violet rays to a greater or less degree than they do yellow light. By suitable comparison with known substance on the earth it is possible to arrive at the minorals that make up the surface of the moon. This idea is in practical use at the Harvard observatory.

Another use of ultra-violet rays that promises great-Another use of directions rays that promises great-ly to surpass any of the present uses is the manu-facture of chemical substances and compounds. First, is the synthetic composition of rubber. Organic comis the synthese composition of runors. Spans com-pounds that have hitherto resisted treatment except by a very tedicus and expensive process under the influ-ence of these rays, readily assume the desired form and make the commercial manufacture of rubber posand make he commercial manufacture of Pubber pos-sible. However, this is so recent as to be largely in the experimental stage, but on July 16th, 1912, a patent was granted to German inventors, Mesars. Graul and Hauschke, for such a process.

use to which these rays is put is the manu facture of sulphuric acid  $(H_sSO_s)$ . Under the influence of the ultra-violet rays the sulphur dioxide  $(SO_s)$  takes on an additional atom of oxygen and becomes states on an adultodat stop of Osygen and becomes suiphuric anhydrid (80<sub>2</sub>), which in combination with water, forms the acid. This supplants the use of the expensive platinum black, and gives a pure process. Many other uses not as yet of commercial importance

expensive platinum black, and gives a pure process. Many ofter uses not as yet of commercial importance are being developed. But the great value of this form can be readily seen from the above. It takes photo-graphs, gives nummer tan, bleaches flour; ripuns repe-tables, sends wireless telegrams, makes the manufac-ture of rubber heels and automobile tires possible, puri-fice debutions are sensitive. fies drinking water, sterilizes milk, and ages whisky

Before a recent congress of German naturalists and physicians, Dr. W. Stempell described the utilization of ultra-violet rays in studying micro-organisms. By the aid of ultra-violet rays it is possible to discover objects which cannot be seen in an ordinary microscope objects which cannot be seen in an ordinary microscope because of their extreme smallness. With the aid of ultra-rieist rays Dr. Stempell discovered the spore of the dreaded parasite that infests the silk-worm— feat the drauded parasite that infrast the silleworm—a feat which would have been utsely impossible with cotd-naty light. Dr. Stempel suggests that it may thus be possible to discover the microbes of infractions dis-eases of whose bacteriological origin little is known. This accompanying litterstrons, Figs. 1 to 8, show microphytographs of the spores of Nosesies becomes lights; semewhat colliquely to the plane of the micro-scope sides (magnification g. 500 e1). Figs. 1 to 4, some-bory all the sides of the side of the side of the side expiral. The littumination is collique, with rays directed parallel to the long size of the three spores.



#### Invention Contest



#### First Prize Article



## What Are the Ten Greatest Inventions of Our Time?

By "Esam" (William I, Wyman, Washington, D. C.)



"Five-and-twenty years ago is a hundred years off—so much has our social life changed in those five leasters."—Theolowsy in "The Nescourses."

THE REPORT OF THE PROPERTY OF

N O single invention of the last twenty-five years initiated an industrial enoch in the sense that the lonometive or Bessemer converter did, yet no former period has been so rich in developments of striking rtance or so productive of improvements whose egate so vitally affected our economic and social





One of the earliest of Tesia's induction meta Although it weighed only a little over 30 pound veloped 14 horse-power at a speed of 1,860 rev a performance considered remarkable at the time

life. In this short space of time the dreams of ages have come true—man has been able to fly, opaque bodies rendered transparent, and intelligence transmitted be-tween distant points without material communicating

This short quarter century has seen the world-wide acceptance of electrical transportation, the introduction of high-power generation and transmission of electricity, the radical changes in construction due to the use of steel and re-enforced concrete, and is

as sees and re-warorose concrete, and innue able improvements in chemical and allied aris. Perfected during this period were such spech-making inventions as smoote-less powder, high-speed steel, contact method of making sulphuric acid, elsetrolytic refining of copper, the quick-act-ing brake, automatic telephone exchange, centrifugal cream-separator, tungsten lamp, Diesel oil-motor, and Harveyized armor-plate, which changed evicting prac-tices so radically or induced economies of such vast degree as to make it difficult to exclude them from any list except by the adoption of a standard so high as to be

adoption of a standard so high as to be unthought of at any other time.

In making a selection from the bewilder-ingly opulest array of creative activities of the period, only such inventions were included as were most revolutionary in character in the broadest fields, which as churacter in the broadest faults, which af-fected most our mode of Urina; or which opened up the largest new sources of wealth. So weighing the murits of the different inventions, it is concluded that the ten greatest and that, approximated that of mechanism commercial introduction, due to I. Shestric terriess, 1881; [7] shears patient. 1884; [4] generals submitted.

As soon as the last estay for the SCIENTIFIC As soom as the stat easely for the ECENTIFIC AMERICAN'S prize contest on the subject "What Are the Ten Greatest Inventions of Our Time, and Why!" seas received, the Editors cast about for judges who, is accordance with the rules, were to consider the contributions. They were fortunate in securing Prof. B. deB. Parsons and Dr. Gustav Lindenthal, men of wide culture and engineers of wat experience. Their decision is rendered in the following letter:

New York, 17 October, 1913. To the Editors of the SCENTIFIC AMERICAN 361 Broadway, New York city.

861 Broadway, New York city.

Gentlemen: Complying with your request to select from the papers submitted for the Prize Article Contest mentioned in the SCRENTEIR ARMERICAN, 30th August, 1913, we beg leave to report to you the following as our decision:

We do not consider that any of the papers submitted fully complied with the spirit and condimited prevention of the papers and the selection of the papers and the paper of the papers are selected as the paper of the papers are selected as the paper part of the papers of the

We also consider the following papers as worthy f honorable mention, via: "Idline," "Kennebec," Nicolaa," "Spero," "Theta," and "X. P."

H. BEB. PARSONS, 22 William Street, New York Dr. Gustav Lindenthal, 68 William Street, New York.

The cesay of "Esam" (Mr. William 1, Wyme which won the first prize of \$150, is published herewith. The eastly of "Altair" (Mr. George M. Dowe, the United States Patent Office), which won the d prize of \$100, will be published in next tocok's Scientific American. The essay of "Cherry Valley" (Mr. W. C. Cahall), who won the third prize of \$50, will be published in the Scienprise of \$50, soill be published in the Scipper and the state of \$50 and the publication of accepting the publication at accepting intercels by the caseny of "Idline" (Emil Schwitze, Baltimore, Mal.); "Ecomodec" (Louis P. Webert, Bath, Maine); and "Nicolae" (Emil Stoog, St. Nocolaen, Wean, Belgium), St. of vehom received honorable mention. The easelys of "Spero" (Or. Thomas Aplus, Fiorinae, Malla); "Thete" (George S. Clements, London, England); and "X. P. "(B. Rev. Even. Washington, D. C. was this. P." (G. Res Fryc, Washington, D. C.) may like-wise be published in the SCIENTIFIC AMERICAN SUP-PLEMENT provided the exigencies of space will p mit.—Regrous of the Scientific American.



PERCENTHALE (8) linetype machine, 1890, (9) induction motor, 1890; (10) electric welding, 1889.

The date of commercial introduction is held to be that from which orderly and continuous development proceeded. No invention was considered eligible which could not provide subject matter for a patent controlling its practical operation for at least a part of the Such a rule excludes re-enforced concrete, the



The newest model of the Mergenthaler linetype.

basic ideas of which had been established in constru tion before 1870, ulthough not extensively practised until ten years ago, while it permits of the inclusion of the electric furnace, the broad principles of which had been known thirty-five years ago

What the Electric Furnace Has Accomplished. The electric furnace, through the generation of a eat so intense as to simulate some of the primal forces of nature, has produced for the first time many absopercially new products. It can make

ariticial diamonds and other gems; it is the only means for commercially produc-ing carborandum (the hardest of all mannfactured substances), calcium carbide (the source of a valuable Illuminant and a nitrogenous fertilizer), and artificial graphite, which is finding extended use in the arts, and it has converted aluminium from a merely precious to very useful metal and reduced its price from more than \$12 a pound to less than 25 cents.
It is responsible for all methods of fixing nitrogen, which, in view of the approaching exhaustion of the natural supply of Chill nitrate, obviates a pos-sible nitrogen familie, and alone makes this agency of inestimable service to

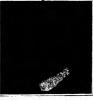
The electric furnace is radically transforming the steel industry. It produces steel of crucible quality with almost open hearth economy, and for the first time since 1740 the expensive and intricate crucible process thats a competitor. In providing rails and heavy-service steel of crucible characteristics in texture and toughness at slight increase of cost ov the comparatively impure and unreliable



The Harvest wireless statles on heard the "Clympic." is important passenger skip in now wighout wireless assaurates.

olden products a revolution of astounding propertions is going on before our very brothers, Hall aml Acheson, in America, Hersan in France. Borchers in Germany, and the Norwegian Birkeland, ure the most notuble igures in thi

development.



Steam Turbine .-- A New Heat Engine

The greatest agency in the service of man is the steam engine. No other device has been so studied, improved and super-reflued. Hut its usefulness reached its ilmits when it failed to satisfy the enormous gre for power demanded in electrical generation and ship propulsion. The steam turbine solved the problem, and the reciprocating engine, which has borne the brunt of the world's work so well during its century's primacy,

has all but been climinated in these two vast fields.

The turbles has effected striking economies in steam consumption, attendance and installation. It has abolished pounding and vibration, eliminated cumbersome and expensive foundations, reduced the space occupied from one to two thirds, and made it advisable to send efficient but older type of equipment to the scrap heap.

Six million horse-power were employed in turbine-driven ships in 1910, and a like amount is used in turbogenerators in this country alone. The days of the re-ciprocating engine are almost numbered—the electric motor is driving it out of the factory and the generation tricity requires turbine installation.

Such is the vast extent of the revolution now being effected in our basic engineering art by the steam tur-bine, invented by Parsons in 1884, but not recognized as a commercially practical proposition until ten years

The Gasoline Automobile and the Change Which It Has Wrought in Transportation.

The inventions of this period which have worked the

most rapid alterations in the more intimate affairs of life are the gasoline automobile and the moving picture. "auto" in this short space of time has developed from a mere experiment to the making of one of our largest industries, has caused the creation of thousands of miles of improved highways, has almost abolished the horse in the cities, has changed to a marked extent the manner of flying of an appreciable portion of our people, and has directly induced extensive and radical improvements in and created dozens of collateral arts.

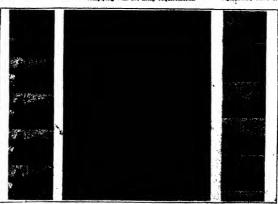
Superficially, the "auto" appears to be the sum a series of engineering developments in which great inspirational achievements were wanting. But no fact is plainer than that its introduction was neither casual nor fortuitous—the whole history of a century's findst-ent but unsuccessful endeavor to provide a practical self-propelled car proves that the success of any type vered requirements would be imthat once ansy Such success did come with the advent of the Daimler or, and not before. The distinctive features of this

motor were lightness and speed, but these were precise-ly the factors that differentiated it from its predece and that prouliarly adapted this engine for its specially designed purpose. As one au-thority says, "The improved engine in 1889 by Daimler was that which really set going the motor-car movement." In that year, Panhard and Levassor Frenchmen, scquired Daimler's putent rights, devised the first motor carringe along present lines, and may be said to be the creators of the automobile industry. In this country, the automobile is making industrial history; the annual output is reaching toward a half billion dallars "nuto" manufacturing centers are growing faster than the beceasing population can be housed, and the value of its than fifty fold in the last cen-

The Moving Pictures .- How a New Art Was Created. The moving picture has



Orville Wright flying at Fort Myer in 1908 and complying with the army requirements.



Thomas A. Edison, the most brilliant of American inventors, and the man to whom the entire moving picture industry pays telbute.

Orville Wright.

larity has a fored since Shake spear time, its ram

coming more varied and extended. As a factor in of coming more varied and extended. As a factor in semi-cation, science, trade, and in recording current history, it has seen its beginning only, and in its application to amnoement in its higher form we airsendy have a promise of a large and brilliant future.

Thousands of theaters are devoted to the "movies" in this country, in which eighty million dollars are inwested, producing an annual revenue fast approaching three hundred million dollars. The whole world is levised upon to "stage" the play, history and travel is levised upon to "stage" the play, history and travel is ualised, and the obscure processes of nature explained and analyzed.

and analysed.

"The "kinetoscope" of Edison "was the first commer-cial appliance to show pictures in natural movement," although he owed much to the Eastman film and price investigations. As with the automobile and aeroplace, great credit must be given to French promoters for first ving its possibilities on a marke

The Aeroplane.-The Realisation of an Age-leng

Next to the philosopher's stone and perpetual motion has man's attempt to fly been the object of most per-sistent pursuit. No other problem in the realm of invention has caused such heart-breaking discourage-ments or called for such sacrifice of life. In spite of authority, however, the quest for the flying n was not chimerical, although it seems but was not chimerical, although it seems but yester-day since success capped the efforts of the Wright

Although the aeropiane is radically transforming military lactics and as an engine of war cannot be ignored, it presents the least commercial utility of all the inventions considered. But because it is in many respects the most radical innovation in the whole history of locomotion and because the perfection of this device opens up possibilities dazzling to contemplate, present utility must be ignored in appraising this strik ing accomplishment. It is only necessary to imagine a condition where frontiers are climinated, valuable way unessential, and fortresses and battle-otent, to realize the overwhelming revolution rights of way up which will come with the perfecting of air navigation-an outcome by no means beyond the limits of possibility.

ss Telegraphy, the New Meuns of Communication

If the aeroplane is the most spectacular achievement of this age, wireless telegraphy appeals most to our magination and dramatic sense. Its importance and significance however are in direct proportion to the

hold it has on our interest. The scheme of transmitting intelligence was never con plete so long as ships at sea and remotely situated stations could not be communicated with. "Wireless" supplied this 'missing link" and made inreommunication as universal as the world is wide. In the short fifteen years since its introduction by Marconi, wireless apparatus has be come nart of the equipm every modern sea-going and naval vessel, has been placed in hundreds of Government establishments and downs of relatively inaccessible at a-tions, has become an important factor in military mayal operations, and, most important of all, has robbed the sea of its terrors and saved thousands of lives through its operation. Rapid as has been its growth, it is but in the infancy of its de-velopment and usefulness and promises a cursor in over communication quite as a poblicionali postali ·马克克斯·斯克克克·西克克

MANAGEMENT OF T

Crimital Process and Way At in a Crimat Invention of Seir Thesa. The crimatic process have been one of the main agencies wherein the world's procession of Seir Thesa. The crimital procession of Seir Thesa crimatic procession of Seir Thesa crima

#### The Induction Motor of Nikola Tesla and How it Revolutionised Power

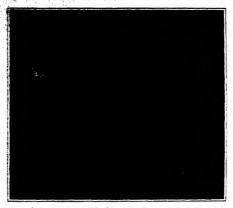
Ninety per cent of electric current generated is alternating because larger generating units can be utilized and the current more easily transmitted. The induction motor, constructed by Tesia in 1988, and independently suggested in principle by Ferrari, was the first satisfactory medium to transform this current into power.

This epoch-susting invention is mainly responsible for the present large and increase in the present large and increase it is working a revolution for working a large and comfort in the mill, factory and working, in making the motor an individual power unit, it has made power arrangement elastic drawing upon energy only when needed and applying it directly only where wanted, and has noblabed lies shafting and beilink. It conserves theiry to sixty per cent of the energy formerly wasted in uselessity whirting line shafting, it aswes overhead space and increases productivity by making the shop lighter, after, cleaner and less missy, and so well recognized are these advantages that establishments in every lig industry are installing these motors as a measure of accounts anti-deferment.

#### The Linotype and the Spread of Knowl-

The "art preservative of all arts," in the department of composition, remained the same in all its fundamental particulars for four centuries after Gutenburg first set movable blocks to form a printing surface. The most intricate devices ever evolved and the most inguelous of forts are expended, falled to successfully supermede hand composition until Mergenthalier's linotype established for feasibility about 1890 and entirely overcame public skepticism and inertia a few years later. It is smough to say that an opperator can set from five to ten times faster than the average hand composition that that the type composed always presents a brand new face, that the coat of foundry type and surillary parapherosita is dispensed with, and that distribution of the type matter is abolished, to recognise the breadth and theroughly revolutionary character of this invention, and to appeads the way werey newspaper and large printing plant in the world has installed meschine composition.

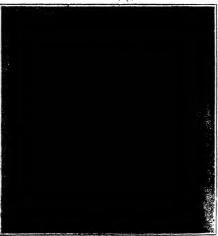
#### The Electric Welding Process of Elihu Thomson.



A typical central station in which Parsons turbines are used to drive electric generators. The portrait is that of the Hon. C. A. Parsons.



The electric furness is radically transferming the steel industry.



The electric walker of Either Theorem

The muchine bers shown will wolf five dissided sight bainfo in an hour. It takes only a few ecousin to mike an shortly wolf. A body survent of electricity at a low voltage this gained through the abusing sadis of the motal pieces to be welded, thereby generating family at the paints of contact, willis at the same time preserve is applied to force.

brome, east tron, etc., but different and wedtably antaconistic metals can be united in a wild union. Simpes so intricate as to be beyond the expacity of welding by any previous device or process, or which could only be joined by rivering, are readity united by the electric welder. The applicability of the process to practically all metals, the disposing of heavy pressures, the surely and swiftness of the resuits, and the economy and elemilius of its working, made it a startling successful proposition from the very first, and now its application is as broad as the metal-working industry field.

The Inventions of most for-cerching effect have been actived multive in the few departments of power, communication and production. Modern civilization received its impense from the inventions of the steam eagine, howematic and telegraph, and the Bossemer converter, typifying these three departments of the inventions selected it will be observed that seven full within these activities. Of the remainder, it is sufficient to say that for the first time we have means to visually transcribe animated life, and have seen hand meliods in two ancient arts superseded by mechine operation.

Of all the great achievements of this period, these ten have been chosen because they are pioneers of the highest order and have been most revolutionary in the most notent fields of service to mankind.

#### The Ten Greatest Inventions

WHEN, a few months ago, the Scient Tipic American offered prizes for the three least essays on the ten genetics patentiable inventions of the just twenty-live years, we had no idea that the question would be a very difficult one to answer. It seemed certain that the inventions could be chosen which would stand out prominently above others and which would hold thoir pre-eminent position with coording argument. In response to our offer essays came in from all parts of the United States, and from almond as well. Among the essays receiving honorable mention, as published on another page, will be found one from England, one from Belgians and one from Matta. It is interesting to note also that several of the essays came from women, showing remarkable interest in invention among the gentler sex.

When the casays were opened, the lists showed a surprising diversity of opinion. No two competitors selected the same set of inventions. In fact, only one invention, that of Wireless Telegraphy, was con-ceded ununlmously to belong among the ten greatest The vote on Arrophnes almost unanimous. But beyond that there not the slightest trace of unanimity This result was, to us, surprising indeed, In the conditions of the contest we had stated that greatness would be measured in terms of practical success and general usefulness to mankind; we limited the contestants to machines, devices, and dis-coveries commercially introduced in the last twenty-five years, and inid special emphasis on the fact that the inventions must be patentable, although not neces arily patented, stating also that the pat-ent might antedate the twenty-five year period provided the commercial introduc-tion of the invention took place within the specified time. With these simple conditions governing the contest, it seemed strange that the contestants could agree on only one invention. But when the mat-ter was put to a vote among the Editors of the SCIENTIFE AMERICAN, we ourselves could not agree on more than half a dozen Arguments n-plenty, and good ones too, could be put up in behalf of a score or more of inventions. The matter proved so interesting that we called for a general vote from our renders on the subject. A dozen essays were picked out at random and these were found to contain forty different subjects

The list of these subjects was published with our call for votes, merely to show the disagreement on the question This (Concluded on page 150)

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#### A Multiple Disk Glass Cutter

FOR more than four thousand years there was no I other means of cutting glass than with the diamond, and it was usually done with the chip diamond. It was, however, very effective, but it remained for an American to invent the little wheel or disk approaching the hardness of the diamond and taking its place for doing this work

Among the several types of wheel glass cutters m factured, one of the most unique is a multiple disk cut-ter with a turret head containing six wheels. These small wheels or cutters are placed around the peri-phery of a larger disk which is pivoted on one side of the holder. One wheel after the other may be brought into the position for cutting by simply turning the turret head by loosening and tightening a screw.

the turret head by loosening and tightening a screw. In order to prevent the cutting edges of the disk from becoming rusty, a disk of absorbent material is placed on one side of the turret head in such a manner that it continually rubs against the upper edge of the disk which is in the cutting position. This absorbent material is filled with oil which keeps the wheels clean and free from rust.

#### Lessons of the Disaster of the "L. IL" By Carl Dienstbach

THE most advanced of all dirigibles, the giant Zep poin "I. II.," completed for the German navy, has shared the fate of one of the crudest early attempts at airship construction—Severo's "Fax." In other words, the "L. II." exploded and burnt in the air and everybody on board was killed. One man, in spite of terrible burns, survived the fall (of 900 feet) for several hours.

No general conclusions can be drawn from this latest No general conclusions can be drawn from this latest and most terrible disaster sustained by a gen-inflated ship. Nor is the conclusion justified that gasless acropianes are safer. If a comparison is made between dirigible and flying machine on the basis of safety, very hour spent in an inflated dirigible must be count-ed against only the actual flying time of aeroplanes. On that basis the comparison will be in favor of the dirigible Aeronauts are not afraid to ascend in a spherical balloon filled with inflammable gas. Statistics covering a century and a quarter have shown how slight is the danger of explosion if reasonable precautions are taken. When Severo's airship caught fire, a commission of French engineers decided that it was due to confined spaces within the structure, where a stagnant mixture of air and gas might collect like so much gunpowder. That explosive mixture, once ignited, is worse than so much dynamite. To the ignition of such a mixture the accidents to the old Severo and the latest Zeppelin are due. Gas alone is as harmless as so much flour. An official rule was laid down at the time of the Severe inquiry that no design with such confined spe severo inquiry that no design with such contined spaces should be tolerated. This rule was easily observed by the old, slow "full rigged" ships, with the car hanging far below, and a goodly draft of air automatically sweeping the intervening space.

Sweeping one intervening space Curlously enough, it seems to have been progress in statisting staunchiness and speed, that eventually brought about a design that embodied the very defect that caused the destruction of Severo's dirigible and made it models for membering seems. made it possible for an explosive mixture to accumulate one quantities

Close proximity of motors and gas bags is highly desirable and even necessary in a very fast and strong dirigible. However flimsy the fabric may seem, it is dirigible. However filmsy the fabric may seem, it is just as efficient in keeping the gas out of harm's way as the plates of a gasometer. The fabric of a Zeppelin cannot be torn unless the frame and the netting which strengthen it break first. It cannot retain the gas indefinitely Still, so little filters through, that a candle can be burned three inches from an inflated balloon, as long us the gas remains at constant temperature and pressure. Gas never becomes dangerous upless it expands from heat or lowered uir pressure, and, over-flowing the balloon through the safety valve, is not in-



Multiple disk giass cutter. The insert shows the turret head and its wheels in two positions.

stantly diluted with enough air to make the mixture bustible

onfined spaces within the structure of an airship are harmiess as long as they are swept by a blast strong enough sufficiently to dilute any amount of gas which may there collect

"f. II." had literally a tunnel running within the hull. Within that tunnel gas leaking from the ball in many compartments could accumulate and mingle with air. She should have had a blower to drive out the hydrogen that had leaked out, or at least to dilute it with an enormous quantity of air. Indeed, she needed



A mine rescue telephone equipment. The transmitter is strapped against the throat so that the rescuer talks, not with his mouth, but with his

a blower as badly as a cosi sains. "Gas" might be expected every time the ship rose or was exposed to the

A blower would not detract much power from pro-pulsion, because it is not needed while the aidp is under full headway. The ordinary ventilators of a steamer become very efficient when they are applied to a speeding dirigible, because the latter gets the wind while the airship is at rest, the motors, instead of run-ntug empty, should drive a safety-fan. Any confined

ces must in addition be sealed and spaces must in addition be seeind against away man, simply by providing such must refer them. I be seeing such that the man of the seeing such that the man is seeing such that the see is see side of the hull, into a distring savisies without furnished by howers which he ship is it was There seems no doubt that in designing and

the "L. II." "internal majety" was overlooke tention concentrated on strength of constructions could be weathern

A Mine Rescue Telephone Equipment THE development of practical telephone significant for mine rescue work to supplement the surplement a for mine receive work to suppessed the exygen appearation now in almost universal use search; a great step forward in providing ways and means for preventing the great loss of life which, in years past, followed every mine disaster. The great value of the exygen every mine disaster. The great value of the oxygent helmet, which permits its wearer to calter a nine and remain in the presence of snoke and poisonous gases for hours at a time without danger of being overcomes, has been evidenced by the hundreds of lives which have been saved through its agency. The iron box mati-telephone has also proven to be of insettinable service in protecting lives and property. In fact, the laws of a number of fattes in which mining operations are conducted, include statutes making compulsory the use of telephone magnerround. of telephones underground.

There has been lacking, however, until very re means for keeping the advance or rescue party in the mine in constant communication with the rear party at the entrance of the mine. The need of this was ad at the entrance or the mine. The need of interest of vanced by the United States Government Bursau of Mines, as well as some of the large mining interests. As a result it is now possible to obtain a light service-able and simple telephone equipment which will mest all the requirements of this unusually severe class

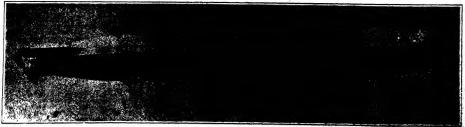
One of the first difficulties encountered in the develop-ment of the telephone equipment for the helmet man was to devise a transmitter which would not interfere With the oxygen belmets and other with breathing. With the oxygen helmets and other types of breathing apparatus in use for rescue work, the mouth is covered in such a way as to prevent its use for talking. This led to the design of a transmitter which is fastened to the throat by means of a pigekin harness and transmits speech on the principle that the vibrations of the vocal cords are transmitted through the throat walls and will in turn act upon the diaphragm of the transmitter. It is essential that the transmitter be held firmly against the skin, and for this purpose a soft rubber cup, which will conform to the curves of the threat, is provided where the mouthplese would ordinarily be placed. It has been found by laboratory tests and tests made at the Bureau of Mines in Pittsburgh that the throat transmitter will transmit

protection of the street transmitter will transmit speech practically as well as the ordinary telephone.

Attached to the same harness with the transmitter is a water-case receiver equipped with a leather head hand to clamp it famly to the ear. The head harness, with its receiver and transmitter, is so constructed that it will not interfere with the operation of any of the various types of oxygen apparatus on the market. The ead equipment, furthermore, is extremely light and oes not in any way inconvenience its wearer.

The telephone apparatus used by the directing party at the outside of the mine is a standard switchboard set consisting of a chest type transmitter and head hand

A "Safety-First" Lescon.—In a recent publication by the Pennaylvania Railroad, whose object is to promote "safety-first" principles among its employees, we note by the Pennayivania Raliroad, whose object is to promote "assley-fure" principles among its employees, we note two illustrations, each showing a man seated on the wooden shield oversing a third rail, and engaged in some repairs or inspection of a freight car. In the first view, entitled "The Wrong Way," the man is seated directly upon the third rail structure. In the second illustration a large rubber blanks has been thrown over the rail to protect the man's body or his tools from easing a short creasis.



The Zeppelin airship "L.IL," which exploded and burned in mid-air, killing twenty-eight men.

### The Heavens in November

#### Three Interesting Comets Now in the Evening Sky

By Henry Novie Brosell, Ph.D.

CARADIS anothrow to be the principal especies of inwiscose this mouth—own move so than last, for three
sit cans are visible (with the thistoppe) in our evening
sides, and two of these are of unismed intersect.

"Metach?" count, of which we spike last month, has
been a conspicuous telescopic object throughout Orthere, meaning right across the dreumpolar sky. It is
now creeding from us and from the frum, and rapidly
growing fainines, but is spill visible lan a small telescope.
According to an aphenesete compressed by Prof. Crayrion and filling key at the University of Coldifornia, the

Levy at the University of Califor of this comet should be as follows:

November 15... 20 hours 46.9 minutes November 80... 20 hours 46.9 minutes November 80... 20 hours 52.9 minutes + 2° 18' The brightness diminishing from 1.3 times that at discovery at the beginning of the month to 0.3 at its end, so that by that time it will be a practy faint object. The comet's orbit, according to the best data so far

The comet's orbit, according to the seem to published, seems to be nearly, if not quite parabolic, and hence it must be very long since it last visited the

able object, but is unfortunately too faint to be observable object, our is annormatical too maint to or observable with small telescopes. There is no doubt now that its critic is cliptic, and its period fairly short, the pre-liminary computations of various astronomers giving periods of from nine to twenty-five years. It syill not perions or from hine to twenty-new years. It syll not be possible to determine the exact period usualli observations covering a much longer are of the orbit here been secured, but the congrutations agree in showing that the conset was in perihelion at the beginning of Reptember, that the inclination of the orbit is small (about 14 degrees) and the motion direct, and that the perhelion distance is shout one and one half times the certify distance from the Sun.

It is not surprising that this comet has not be observed at its earlier return, for (as the diagram pub-lished last month clearly showed) the present appear-ance was so timed that the comet came about as near ance was so timed that the comet came about as near as possible to the Earth at the same time that it was nearest the Sun, and so appeared as bright as it was nearest the Sun, and so appeared as bright as it was nearly to the same time to seem. Even so, it was only of the magnitude 11.5, and is now a good deal fainter. If it had come along six months excite or later, when the Earth was on the opposite side of the Sun, it would never have appeared brighter than the fourteenth magnitude, and would have almost certainly excepted distinctions of the sun of th

emarkable thing about it is its tele Are most remarkace thing about it is its belescopic appearance. Frof. Altient of the Lick Observatory (a very experienced observer of comets) says concerning this: "In the monilight the object showed very little resemblance to the ordinary comet. It

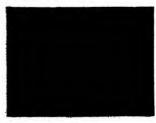
had the appearance of a star of magnitude 11 or 11½, with no more than the merest suspicion of nebulosity. Indeed, it was only detected by its motion." Later, on a dark sky, "a faint brushy nebulous extension, like a short tail, was seen to extend three or four minutes of arc to the southeast from the nucleus." are to the southeast from the nucreus."
No wonder that Prof. Aithen declares, "I have never seen an object like it." It will be of great interest to learn just what the character of its orbit will finally prove If the shorter of the computed periods is correct, it will have almo many points of resemblance to an asteroid

many points of resemblance to an asteroid as to an ordinary cound:

The ophomeris now at hand for this counct runs out in the middle of October, but by approximate extrapolation if would appear that on October 30th its position, should be in 28 hours 30 industes jl. A. and 35 degrees 17 minutes, nowth declination; and its motion a little seat of noethward, at the rate of about eight handsome of any per day. It will however. he of the property of the property

ward, at the rate of about sight indicates of any par day. Is will, however, he of he upon at all for the omnature with a must insert manner to the part of the pa

was dispossed on July Seth, 1600, by Westphal at Ofcitions, and observed upth January 11th of the following year. When speace the Barth it was easily visible to the naked eys, and had a tall shout a decree in length. The observation accessed at that appartion left no doubt that its orbit was an ellipse, and its od about sixty years. All the available data were period acoust many years an use a variance out of the rediscussed a few years ago by the Austrian astronomer Hagtel, using all needful redocuments of calculation, and allowing for the perturbative effects of the attractions of Jupitar and the other planets. He con-



The erbit of Westphel's comet.

cluded that the period indicated by the observations as most probable was 61.71 years, but that any period within six months or so of this might be as without doing violence to the observational data.

without comp violence to the observational data. For a year or two back, Hnatch has published "search ephamerides," telling "when to look for the comet on various hypotheses regarding the actual length of the period. As soon as Delavan's discovery was announced, the was seen that his comet was in the right place, and when it appeared that it was moving in the right direc-tion and at the right rate, there remained no doubt

An independent calculation of its orbit, made at the An independent calculation of its orbit, made at the University of Culifornia on the basis of the first week's observations, assuming only that the period of the orbital motion was known, yields values of the other elements agreeting closely with those of the comet of 1802, and shows that the exact length of the revolution just completed is 61.118 years, the comet returning to partision on November 20th.

The orbit of this comet, with those of the planets

from the Earth to Uranus, is illustrated in the an nexed diagram. The comet's orbit is supposed to be in the plane of the paper, and to be seen "in plan." while the orbits of all the planets are seen parily edge wise, and hence appear elliptical, though really almost circular. They actually lie in a plane inclined about 41 degrees to that of the comet's orbit, so that the parts of the orbits drawn in the diagram with full lines must be supposed to be above the paper, and the dotted

With this explanation it becomes apparent that the et's track passes very pear to those of Mars and Jupiter, and fairly near that of the Earth, and that it can never come at all close to any of the other planets As in many other cases, the close approach of its orbit to that of Jupiter is probably by no means a matter of chance. It is well known that if a comet passes near this great planet, the influence of his attraction may radically modify its orbit, changing it from the origin parabola into an ellipse, if Jupiter's attraction slows the et's motion, or into an hyperbola, if it accelerates it

After such an encounter, the comet will pursue a new course, which, since it passes through the place of meeting, must of course come close to Jupiter's For many revolutions the comet's track may now anffer little change, if it does not pass the critical region at the same time that Jupiter does; but the tell tale nearness of the orbits will preserve the history

It is probable that most, if not all, of the county of short period got into their present orbits by this process of capture; and in the case now under consideration or capture, and in the case now inter consideration we can say with some confidence that Jupiter was the capturing body. Mars, though it may sometimes come almost as near the comet as Jupiter, has so small a mass (only about 1/3,000 that of Jupiter) that its attraction is relatively quite ineffective.

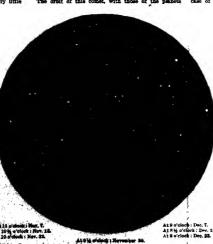
Of course, the encounter which originally changed the comet's orbit may be repeated at any return, and sooner or later is bound to be rejeated. The two bodies, some time or other, will come to the junction point almost at the same time, and the comel's orbit will again be greatly changed. It is practically an even chance whether the comet will be accelerated— making the orbit much bigger, so that it returns at longer intervals, if at all—or retarded, in which case ellipse again grows smaller, and the period si

Westphal's comet will not come at all uncomfortably close to Jupiter on this return, nor did it at the last. To attempt to calculate what happened longer ago by carrying back the present period would be illusory, for, even if the comet did not come very near one of the great planets, their attraction (as in the similar case of Halley's comet) may cause the intervals be-tween returns to vary by many months

comet itself is not a large one and would be a faint object if it, too, was not favorably placed with reference to the Earth. The various estimates of its brightness made soon after its discovery indicate that the central nucleus was of about the eleventh magnitude, while the whole brightness of the head was about the eighth magnitude. Theoretically, this the comet was at its nearest to us just after its discovery and is now slowly re-ceding. But it is still approaching perihelion, and the light of a comet usually increases rapidly as the Sun's rays act on il with growing intensity. Toward the end of November, the conditions are al-most as favorable as they were in 1852, when the comet was about of magnitude 414, so that it may become visible to the naked eye. In any case, it will be a pretty object in even a small telescope. Even at the end of September, it showed a bright, round coma, and a tall which could be followed visually for a degree or more

From the ephemeris published by the workers at the University of California, the comet's position will be as follows





NIGHT SKY: NOVEMBER AND DECKMBER

#### The Blowing Up of Gambon Dike

Plooding Calebra Cat With Water from Gaten Lake WHEN the Pausna Canal is opened for traffic its adipping will pass from ocean to ocean through a fresh water censi, formed by the dumning of two rivers, the Chapter on the northern side of the contineutal divide, and the Rin Grande on its southern side The waters of the Affantic will bever, as is popul surround, minute with those of the Pacific; fee although the canal will serve to connect the two on by reperiting the respect of shinging from the one to mit-restor protions of the cenal, one extending for sever uslies to Gatus lorks, on the Atlantic side, and the other, on the Pecific side reaching from Minuform er is distance of 8% miles to deep water in the Parific. The intervening \$5 miles will consist of fresh water. If it should be decided he the far future to cut down the canni to see level, sait water would then he free to flow from one ocean to the other

The thirty-five mice of fresh-water canal or of two lakes. The larger, Gatan Lake, bying to the merth of the divide, has been formed by the ere of a dam at Gatou. It will be maintained at the detion of 85 feet above sea level by the continu eta infor of the Charm Elver, whose waters will been elevely to the Atlantic, part of them finding their way through the looks, part of them over the salilway in the center of Gatun dam, and a considerable purties being lost by emporation from the far-spreading sur square pulles) of Gatun Lake. At the southerir end of the take in the nine-mile Colabra out through the divide. The water le this cut will be at the same jees no the lake, and this level terminates at the Pedro Migeet locks, through which shipping will be lowered 40 feet, to enter a small lake formed by damning the ade River. The ship channel through this lake is about a mile and a quarter in length, and at the tiberly end it egiers the Mirafores locks, in which ships will be inwered to the level of the Parife O The Rie Grande River will continue to flow to the Pa effe through the lake and locks or over the Mirefores

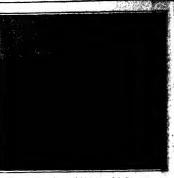
As everyone known the beaviest work of excavation eets done in cutting through the continental divide at Quistra. Work on the cut was began by the French on Jacoure 50th, 1882, when the following cable was sent from Panama to the Bulletin du Canti Inter occasions, which was published in Parts by the French "The first work on the great cut of the maritime canal was formally insugurated to-day in some of the distributes of the State, the leading citizens of the city and the great amenitage of the people. The first iconscitive has arrived at the newly opened acceptation. The city of Panama is celebrating the exect with a great fate.

During the intervening thirty-two years, about 100,-600,000 cobic rands of material has been taken from the great executation; and the practical completi the work was rejeitabled at 2 P. M. October 10th, when Wilson in Washington threw a switch which, threach the medium of the telegraph and cable lines. touched of a blast of 40 tons of dynamite, and made a breach in the Cambos dike, which during the progress f the excevation had served to keep the rising waters of Lake Gatun out of the est.

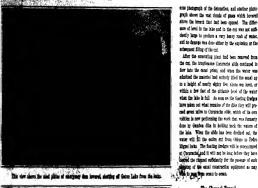
The Chapter Elver, which in the rainy season is entitied to finds of great magnitude, flows in from the west and interaccia the line of the canel at the northaris end of Culeira cut, where it swings to the north on its way to the Atlastic Ocean. On the southerly adde of the river, a massive embankment of earth was built across the canal, and raised to a sufficient height to pravent its being overlopped by the beariest fi the Chagres. I'mder the protection of this dike, the steen shorely, of which at one time there were as many

When the Gambos dike was built, means laid to be posited for getting rid of the drainage in the nin-nilo length of the cut. This was done by laying four 28 Inch iron pipes through the bettern of the dike, and building a remitty piece to draw the water from the cut and discharge it late the Chagres River on the opposite side of the disc. When the exercition of the out was practically completed, and the stoom abovels, locountives, and dirt trains had been removed, together with the tracks and various equipment, the first stetoward filing the cut with water was to open the dreinage pipes and allow the water to pass into th cut from the lake. This was done to provide a cut on the laner side of the dam and localize the effects of of the expiration. Over one thousand holes were defined in the dike and each was loaded with from eighty to one intuited pounds of dynamics. Many a hig blast had been set of during the construction of the canal but this one, consisting of forty tree of drammite, was the innest

the the feet page of this term is shown as instanted



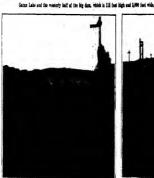
After the explosion a great cloud of gases being over Gambes dibe



THE RESIDENCE OF STREET PROPERTY OF THE PROPER



Gambon dam after the explosion; water flowing into Culebra cut.







Gambon dike, from Culebra est, before explo-

Usper locks, Geten. M

Conist wall of Gaten looks, looking toward the lake



At left is a mornbin dam awang acress or 

eous photograph of the detonation, and another photograph shows the wast clouds of gases which herered above the breach that land been opened. The differsace of level in the lake and in the cut was not suffclearly large to produce a very beavy rush of wat and no demage was done either by the excitation or the seat filing of the cut.

After the excavating plant and been removed from the cut, the troubleaume Cururacha slide continued to fow into the care) prism, and when the water wa admitted the materies had controly alled the canal up to a height of nearly eights feet above we level of a few fact of the ultimate level of the water when the lake is full. As soon as the firsting drades staken out what remains of the dike they will proreed asses triles to Operatories slide, which of its out ion is now performing the work that was formerly done by Gambon dike in holding back the waters of the lake. When the aide has been dredged out, the water will fill the eating out from Object to Point guel locks. The floating dredges will be exceed rated at Cocuracia, and it will not be long before they have their the channel sufficiently for the passage of such

#### The Channel Tunnel

T the first France-British Tearing Congress, held Ast Loudon, Barro E d'Erlanger read a report be fore three hundred members upon the present status of the proposed Chappel turnel. Speaking first of the ory of the formation of the first junnel company is 1878, soon after the difficulties of a diplometic order had been overcome, he then referred to the projects of the treasur content. Construction work and excesse of the tounes will be divided into two equal ports. The Exclish and the Prench concentes will thus be rectified to balld about 12% miles of tuncel and to furnish a capital of \$40,000,000. He then dwelt upon the advantages which would be afforded by a tunnel con France and England as remove touring and from a rial and military standpoint. Denger to Eng land from an investor from the Continent, which is one of the male objections to the enterprise avoided by establishing first around the English en create, and also by taking the proper measures of construction so as to not the tunnel out of use in a few be to fill up the tangel with weter. The project is one of view, but also has a wider some than more terrolary two nations

#### The Chronology of Aviation

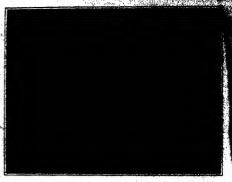
THE SOMETHIC ANGRESS has received from Mr. Hudesu Maxim and Mr. William J. Hammer a limited number of the reprints which they have just issued of the very complete "Chronology of Aviation," ariginally prepared by these gentleman for the World Almanac of 1911. The data embrace the essential facts relating to acrial progress. In eddition to a abort his totical released, one finds berein taking giving addition recrets, speed records, quick starting and slow-speed inger extraing, English Chausel and other over-water flights, erose-country flights, soluble distance and duration flights, etc. There are also establies relating to accidents and data relative to scherical and diziglate bathoose or alrelatos, etc. Of no email interest ers the tables riving the most important fights of the Wright brothers. There are doubtless many readers of the Acustime Authors who are much interested in this subject and who would be glad to secure a copy of this interesting brochare. They can do so by applying to the Aeronautic Editor of the Scientific AMERICAN SET Reseducy, New York

#### The Current Supplement

IN this week's lesse of the Sterrier Augusta Sur-Perment Mesers Language and Groupe oxiciate the of tangeten lamp battle and the archeds devised to avoid this type of deterioration—It A Gradenwitz describes the new aquariess recently completed by the rman capital - A. Lockett, traving the labstories ore lation of the modern sterooscope, tells the resder many Acts about the instrument which are not very generally keeps\_L Wilher contributes an article of perullar at on the controversy as to the reasons fo prographical distribution of the pums and the juguer -A very excellent and highly instructive set of road models prepared by the Office of Public Roads is illustrated and described -Dr. A. D. Little, to his presided liel address before the American Chemical Sortety, gave an excellent expedition of Industrial Research in -what it has done and is still destined to do for this country. Extracts from this rather amount in tributes an illustrated article on the Victory more







The monetype casting machine. Reversing the report.

## The Principle of Reversal

#### A Suggestion For Inventors

By Henry Harrison Suplee

It is beginning to be understood that one of the greatest methods of conserving human energy and of using
it to maximum efficiency, lies in the employment of
methods and spiparatus for enabling the skill of the
trained man to be used repeatedly by others who are
sees skilled; or even by the employment of wholly
inatimate machinery. This is only an extension of the
treamendous step which was made when the discovery
of writing, and its follower, printing, enabled the experiences of men to be recorded and accumulated; but
it includes also a discovery, much more recent in point
of time, that the most efficient method of recording is
that which, by the operation of reversal, may be made
to repeat the recorded operations indefinitely.

Although this idea of making records in such a maner that they may be used to repeat the operations which originally produced them, has been known for many years, its practical applications have been comparatively recent. Preceding such automatic methods, there appeared the germ of the process in such devices as the musical box, in which pins, pinced upon a revolving cylinder, enabled nelodies to be produced repeatedly. Similar devices are found in certain tools, in which hearfully formed canns are used to permit a definite sequence of operations to be conducted according to a predetermined plan; while the operations of the perforated cards of the Jacquard loom, and of the various devices for physics upon the plane, by means of perforated rolls of upper or metal, are well known.

ased rous or jusper or metal, a new with flown. In most of these devices, however, and of those based upon them, the original record is made by carefully operated tools of special decay beforehand, but even under such conditions, they are of the utmost importance as indicating a principle which should be more fully appreciated than it now is. The true method for ouising the skill of the trained man does not lie in employing that no do over and over again the things which he can do see well; if their in certain glass skill recorded upon such aprecial pieces of mechanism as can them seen only one of the condition of the seen of the condition of t

The principle of inversal, however, extends still further, and makes the original record its own translator. A number of yours before the invention of the phonograph, there was decised an ingenious maching, invested by M. Leon Sect., and called the phonograph very much, except that the recording stylus was a stiff birdle and made its record upon a cylinder which was covered with a coating of lamphiack smoke. When any spoken or sung sounds were delivered into the funnel, the stylus diade a record of undulating lines upon the smoked surface of the revolving drum, and

numerous ingustoms and partially successful attempts were made to translate these waves into the anomals by which they had been produced. Success we extincted, however, only when Ridmun applied the principles of reveals, and made a machine in which the indontations in a recording cylinder were made to reproduce further than by which they had been originally produced; thus entirely similarities any intermediate process of translation. The detailed operations by means of which the original sounds, mechanically intermediate process of original sounds, mechanically intermediate in the original sounds of the control of

the modern principle of reversal.

In the case of the mechanical apparatus for reproducing music upon the piane or organ, a similar principle is being irrowled. Instead of making the record by a mechanical transcription from the written sheet music, it is now possible for the musician to perform upon a recording instrument, and the marks than inpressed apon a moving strip used only to be cut out to canable any player-machine anywhere to reproduce the original, record thus made.

the original record thus made. One of the most extensive tilbatrations of this principle of reversal now in existence appears in the case of the chresstormph, or mortapeletters metaline. Here a number of trained performan, with all increasing no execution, are employed, at a very considerable expusse, to produce the cristians record; but once produced, the may be repeated indefinitely, with every detail of movement, factal expression, and even coloring, in as many places as may be desired, with no further effort on the part of the original actors, who, in fact, are thereafter occupied in producing other tilms, and in doing once for all, things which are thou capable of repeating themselves indefinitely thereafter.

We see here the possibilities of the principle of reversar for the conduct of the world of the w

The modern system of scientific meanspanent recognizes this principle, in a crute and histind way, by the employment of a planning department, of which the function is the preparation of instruction cards and information, to be closely followed by the workman to candle maximum production to be realised. The workman being stimulated by a wase system based upon productivity, and raided by the instructions of the planning department, is thus employeed to be eached to attain maximum efficiency.

It has feen remarked that such a system makes of the workman nothing less than a meckine, and this being the case, it remains to push the method a little further, to its parfectly legitimate conclusion, and make it possible for the planning department to reduces the interrections to a mechanical record which, when placed in the tool, in a manner similar to that followed in the look, in a manner similar to that followed in the Jaquard loom, or the monotype composing machine, shall proceed without any human supervision whatever. That this can be done must be conseded, almos it is reduced that no machining operation is so complicated, either in sequence of movements or in timing, as it found in an elaborate motion mustal composition. Furthermore, it is possible to speed up the performance of a mechanical record to a rate for higher than that at which it was originally made, the limit in this case being, not that of the workman, but of the juestical and frictional resistance of the machine. When a number of machines are to be employed in making identical objects, it is entirely possible to use one master record or all, using duplicate records for the serveral machines, or, by electric or presuments communication, employing one record to moveme all the machines.

objects, it is entirely possible to use one master record for all, using duplicate records for the serveral machines, or, by electric or pneumatic communication, employing one record to govern all the mischines. In the production of a master record by the skill of a trained workman the time employed in making the original is wholly secondary to its perfection. A nam may well spend hours over the pneumanet record of a few movements when he knows that it is to be resproduced precisely thereafter by hundreds of machines at speeds far exceeding the possibilities of direct humans control.

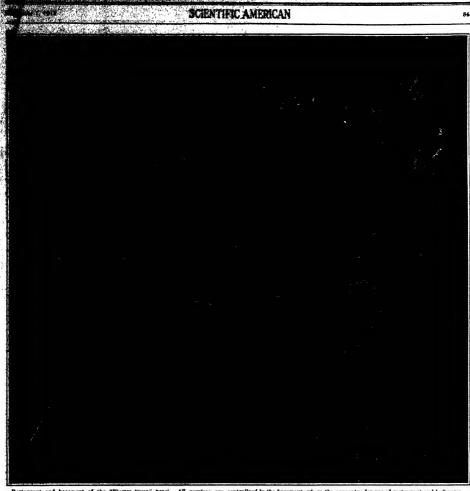
himani control. Following out the principle of reversal, however, the apparatus upon which the skilled operator is employed, should contain which the skilled operator is employed, should contain which the the recording mechanism, and thus there may suppear a new system of machine tools, consisting of a single master record-making machine, to be operated at slow speed by a skilled workman, this apparatus being employed wholly in making records to be translated by a battery of reproducting machines engaged in product's work. The master machine should produce a parfectly finished piece, being governed and controlled by the trained operative, and run as slowly as may be necessary to insure perfection in the product and in the accompanying record. The reproducing tools, once appoiled with records, may then be driven at queets limited only, by mechanical considerations, such as-sigh sensonit of gover required, the resistance of the metarial emptoped, and the inertia effects of meving parts.

the resistance of the metacial employed, and the insectin effects of moving parts.

There is no more need for the skill of a man's hands to give with him than fare the printed record of his foughts to vanish from the partned record of his earth. The movement of the hands, are well as the word spoken by the lijks, may bisoness as effectively recorded for future service himselfer he julie written word or the unitsed need.

An Alarm That Rings Fects shiple House. An investment has designed an alarm for astimonishing with the children of the control of discoveraged the one that I he colored that furging the state of the colored that furging the state of the visital sources to the colored that for the visital sources that design, minimum the plant is not the visital to the colored that design, minimum the plant is not the visital to the colored to the colored to the plant that the visital to the plant that the visital to the plant that the visital to the colored to the visital that visital that visital that visital that visital that visital visital that visital visital

The second



Restaurant and basement of the "Electro-Fura" hotel. All services are centralized in the basement, where the apparatus for use of restaurant and bedrooms is conveniently arranged for supplying any guest by pressing a few electric buttons.

#### An Electric Hotel in Paris By Juoques Boyer

M GEORGIA KNAP, the inventor of the electric house which was described in the Schenipiro America at December 4th, 1909, proposes to erect, in paris, a hotel, which will be a marrel of electro-

mechanics.

In this hotel, for which the name "Electro-Feria" has been chosen, all of the services are contralised in the beamont. Here all of the spractice required for the agentice. Here all of the spractice required for the agentice of the restaurant and the bedrooms is arranged an oneastemisty that fits agentue rean promptly expert the needs of any guest by pressing a few electric buttons. There or four misuple are occupied by a next of negroing a prescript mitten. There are four misuple are occupied by a next of negroing at prescribes the the necessing real to a page 1000 per present the four the prescript of the prescript of the necessary "In this hotel, for which the name "Electro-Feria"

and shutters open and flood the room with light. The top of a chiffonier, placed beside the bed, turns and extends itself over the bed to form a convenient table. The breakfaxt and the letters appear on the chiffonier, and, in less than a minute, all of your desires are satissed, for your room is connected directly with the base-ment, where the operator has at hand the means of furnishing everything that you require with a minimum

meets, where are operator are guire with a minimum of delay and exertion. The rectangust of the hotel is served in the same manner. Eachs small table, for two or four persons, is provided with a dictagraph, which is placed in the lamp stade. You touch a button and a voter from the lamp stade. You touch a button and a voter from the lamp stade asks what you wish. You give your order in a loud vote, without putting your mouth to a telephone. A directed platter in the center of the table situs and presently re-appears, ladon with this hope you have ordered. As some as you have helped yourself, the platter again sinks and in twenty seconds relations with the disks ordered by your neighbor. The plates, etc., give changed, in a very convenience spit from the platter with fall providing the service are due to the dispendence abstractaging in the service are due to the dispendence and relightly of the services are due to the dispendence and relightly of the service are due to the dispendence and relightly of the service are due to the dispendence and fragitation are relations. The platter and dispense and dark neight are princed at platerals of states of the sead and suggisted new restaurant tables, or short guisses, who can thus be served by a single water in addition, its "countries" varior is provided for overy

eighty gnests, for the work of changing plates, etc. Each guest receives, with his order, a check which is numbered to correspond with his individual push but-Payment may be made to a cashler at the door, or by means of the service elevator, according to the

system adopted. Tables with twelve seats, for dinner parties, will be operated in the same manner, except that each dish will move along the table to the person who has ordered it, guided by the unseen mattre d'hotel with the aid of a wide-angle periscope

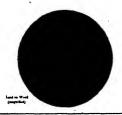
The visitor to the basement will see dishes of food ming automatically from the adjacent kitchens to the hundreds of little elevators that communicate with the

restaurant and the apartments, and solled dishes going automatically from the elevators to the electric washing

The plan adopted for the electric hotel is the result The pain adopted for the electric note is the result of long study and research on the part of its projector, M. Georgia Kusp, in collaboration with M. Danger, the well known Parisian architect. The bedrooms are conwell known Parisian architect. The bedrooms are con-structed and arranged on an ingenious system which allows the little elevators to reach the rooms without wasting space or making themselves completions. The rooms are separated by corridors two feet wide, in which the electric wires and the hot and cold water so pipes are placed. There are no radiators in the reopis, which are heated by a novel system involving no com-There are no radiators in the respits, plicated apparatus. Danger of fire is eliminated by with placing all wires and pipes in condults of fiber-cement.

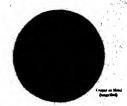
## Metal Plating With the Air Brush

The Remarkable Results Obtained With the New Schoop Process





How Pulverized Metal is Sprayed on Objects by a Novel Invention



NUMBER of processes for depositing a coati A NUMBER of processes for depositing a comment metal upon the surface of objects—usually it selves made of metal—have been well established selves made of metal—have been well established. many years past. The principal of these are the electrolytic method of plating, and the application of a coating of melted metal, as in the so-called process f "gaivanising" iron in the manufacture of timplate. But these processes have their disadvantages. Elec-

tro-plating is a somewhat delicate, and at the best a alow operation. Gaivanising, too, is not altogether a snow operation, and many hitches are liable to occur in the process. At the best it is crude, the product is sot very stable (diplate runts rather easily, as every one knuws) and delicate objects, with fine markings or re-entrant corners, can not very successfully be treated by immersion in a bath of molten metal.

We have had occasion to refer to the new proce We have had occasion to refer to the new process invented by the Sivias enqineer, Schoop, which not only is free from the disadvantagee pointed out above of the older processes, but which has a practically sufficient of the control of the practically sufficient of the control of the practical of the carried out and the fact that it can be applied to lifer-sity any surface whatever. A moitre meant better ardently be used only in dealing with metals are other productions of the process of the process of the pro-ting of the process of the process of the pro-ting of the process of the process of the pro-ting of the process of the process of the pro-ting of the process of the process of the pro-ting of the process of the process of the pro-ting of the process of the process of the pro-ting of the process of the process of the pro-ting of the process of the process of the pro-ting of the process of the process of the pro-ting of the process of the process of the pro-ting of the process of the process of the pro-ting of the process of the process of the process of the pro-ting of the process of the process of the process of the pro-ting of the process of the process of the process of the pro-ting of the process of the process of the process of the pro-ting of the process of the process of the process of the pro-ting of the process of the process of the process of the pro-ting of the process of the process of the process of the pro-ting of the process of the process of the process of the pro-ting of the process of the process of the process of the pro-ting of the process of the process of the process of the pro-ting of the process of the process of the process of the pro-ting of the process of the process of the process of the pro-ting of the process of the process of the process of the pro-ting of the process of the process of the process of the pro-ting of the process of the process of the process of the pro-ting of the process of the process of the process of the pro-ting of the process resistant materials. An article in order to be capable
of being electroplated must be conducting at least on its ecting at least on its surface. But Schoop's process will cost any surface, however perishable or fragile (paper, lace, etc.) in the briefast time with a perfect metal coating.

Reveral types of apparatus have been devised for carrying out the process, but in its most perfect form the thetrument employed is a "pisto" held in one hand, and provided with an oxyhordoren blast, which pro-gressively melts a metal wire fed to it, while an air rays the melted metal against the surface to

An idea of the applications to which the probe put may be gathered from the examples shown in several of our engravings. Objets d'art molded from etc., and coated with a film of metal, form exceedingly attractive ornaments. But probably the most important use of the process will eventually be its application in the industrial arts, for lining vessels to make then resistant to various liquids and reagents, for coating structural work, such as from bridges, to protect it from the weather, and for innumerable analogous purp The coating prepared by Schoop's process adheres tenactously to the surface upon which it is deposited. This firm grip is explained when we look at the microphotographs on this page, which show how the metal forming the outer coating forms an intimate bond with



The film boxes and internal mechanism.



Trademark made by spraying tin through a stencil on terra cetta.

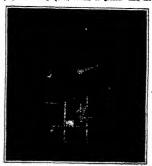


A terra cotta urn and a cement lion, both covered

the surface of the underlying material—copper in one case and wood in the other.

The Schoop process is still in its infancy, at least so far as its application in the arts and industries is

someoned, and there is every reason to expect a wide field of usefulness for it in the future. But while the couling obtained by direct spraying of an unprepared surface adheres thus tenaciously to the an unprepared surface ameres thus tennerously to use substration, it is quite a simple matter to obtain a detachable casting or mold if the surface is previously prepared with graphite, talcum or grease. And the



Front view showing the air mother and gyre

old can be made just as thin or as thick as simply regulating the length of time of apraying, is needless to point out the many possible applicati of this form of the process.

#### A Cinematograph Hand Camera By the English Correspondent of the Scientific American

DURING the past few years the increasing demand for topical and big-game, or hunting, motion pictures has emphasized the shortcoming of the coaventional apparatus for such work, and the need for some compact, tight instrument which can be handled with the simplicity and case of the ordinary snap-shot app ratus. The first commercial success in this direction exynski, the Polish scien has been achieved by Mr. Prossynski, the Polish scien-tist resident in England, who has perfected such an inent, which is known as the sero

The camera is driven by compressed air and is absolutely automatic in its operation, the exposures being made regularly at the desired number per second, all the while the control button is depressed, and so long as there is sufficient air in the reservoirs to drive the mechanism. The instrument, measuring 12 inches in mechanism. The instrument, measuring 12 inches in what he length by 84% inches in width by 64% inches deep and selength by 84% inches in width by 64% inches deep and weighing 14 pounds, is entirely self-contained. It is fitted with separate film boxes inside the camers, any number of which may be carried and changed in full daylight like the common map-shot camers, apol. When loaded, the camera normally has 800 feet of film in the spool-loop, and the air reservoir as are of wificient capacity to enable 600 feet of film—two boxes—to be expected upon a single charge.

Externally the camera resembles the ordinary and solution instrument, with the exception what on once

shotting instrument, with the exception that on one side is the film counter, while on the other is the airvalve, the speed regulator, and the starting button, to-gether with view finders. On the top is the indicator gether with view induces. On the top is the industry, notifying the volume of air remaining in the compressed air reservoir. The camera is divided into two main compartments. One contains the film boxes, access to which is provided by means of a side door, while the other contains the intermittent film-moving mechanism, motor, air cylinders and a powerful gyroscope. If ired, the whole of the internal mechanism can be withdrawn intact in a few moments for the purpose of cleaning and overhaui, and without disturbing a sin mponent part.

The compressed air is contained in four cylinders placed side by side and interconhected, so that as soon as one is exhausted the next comes into action.

air reservoirs are charged by means of an ordin (Concluded on page \$644)



## PLY PATHETED INVENTED IN

man columnic are open to all parentees, meltion are inserted by special arrange, t with the inventors. Terms on applies to the Advertising Department of the district Addances.

#### Persaining to Apparel.

Persanting to Apparel.

\*\*MEMOD AND MICE \*\*PROTECTOR\*\*—F. P.

\*\*Bids.\*\* New Yerk, N. Y. The purpose here is a provide means which may be utilized both as a heed and neck protector, or only as the atter. Further, to provide a protector or buffer designed to fit around the neck and for carry a new which is adopted to be folded to a pastition in the protector when not in use.

a patition in the protector when not in use. WOVERN TOUSTLAR TEMP. J. C. Gavron. WOVERN TOUSTLAR TEMP. J. C. Gavron. 485 M. Altet Rt. Fataron, N. J. The investigation relates to a warve and a protect secured hereby, and provides such a wover fabric as to protect spaced futular members in occasioness fabric. It also provides a fabric in continuous rish parasaged with spaced tubular portions and as extra or supplemental portions of the space of tubular portion.

EAT PASTEMEN.—Bassa T. MILLAR, SIS Sides Ava. Sin Adobtich, Fox. Jim investigation of the provided of the pro



curely held to the head of the wearer, and which may be readily removed from the head without entangling the hair. The device is one which will securely retain the hat in position and which will be removed from sight.

#### Blantrical Boyless.

Electrical Beviese.

ELETATOR EIGNALING APPLATUS.—T.
Poerus, 372 Dans St., Brooklyn, N. Y., N. X.
The specific object in this case is the provision of an automatic switch in the circuit of
oach roset magnet for all the push button and
signal circuits of cach shaft, the switch being
viting the second of the second of the contively coanceted with some moving part of the
oar hesiting mechanism, so that, when the
oar hesiting mechanism, so that, when the
oar is stopped, the speed responsive device will
close the resetting circuit for the particular
signal magnet that has been senergized by the
pushing of the signal button where the passager desires to board the cur.

#### of Interest to Parmers.

TREE PROTECTOR.—C. I. Heas, R. F. D. No. 1, Phoenix, Aris it is the design of this investion to provide a protector hy which the trees can be thoroughly protected, the protector being adapted to extend from the ground to



the branches of the tree, and to hold a cytin-drical hody of earth extending around the tree trush at all sides to the evone and naneag the irranches, as shown in the accompanying

The common of the control of the con

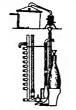
eparation and automatic in its action; and provides means for numberding, during the handless described, he fived of rotion to the halves hopper.

NATURE AND ADDRESS PLANTES—0. R. TARTESS PLANTESS PLANTE

Of General Interest.

FOLDING DARK ROOM—7. Marko, F. O.

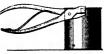
Box 583, indinaspolia, Ind. This invention is an improvament in folding dark rooms for use for photographic purposes and has for its object the person of a device by means of the country of



ing the distillate of volatile and essential olis of all kinds, including spirits of turpen-tine and olis heavier than water. The appa-ratus also serves for purifying and filtering all kinds of fixed olis. It operates automatically after it has been started and regulated.

#### Mardware and Tools

CAN OPENBE.—J. B. Locasino, 15 de Novembro 52, Para, Brasii The principal object which the present invention has in view is to provide an apparatus to cut the extended



CAN OPENES.

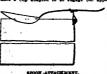
edge of the head or top of a can, to permit the removal thereof. The point is rigidily forced through the metal, when thereafter the carved edge, rising, cuts the metal forwardly. The tool is then employed in a manner usual plars or cutting tools of analogous use and construction.

#### Heating and Lighting

Heating and Lighting.
AUTOMATIC MID DEUM FOR BOILERS
—A. F. SEREY, P. O. Box 565, Relsington.
Kas. This Invention pertains to mud drams
for boliers, the particular purpose being to
provide a drus so constructed and arranged
as to be automatic in the sense that it operates continuously and positively lis the removal of sediments from the bolier.

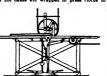
#### Mousehold Utilities.

BPOON ATTACHMENT.—J. W. LUMBARL,
Box 555, Thomaston, Conn. The attachment
is fixed to the back of a spoon handle and includes a clip adapted to so engage the upper



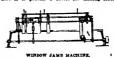
end of a pot, pan or either cooking wrendl as to assessate the epoon in position and a zorol device for securing the city to the upod handle, to permit the city to fold against the handle, when not in me, or to be turned to expeculipately a right imple to the handle.

chican and Mark dant Berte MACHINE FOR STRIPPING OIL CAKES. T. J. McNeser, Breekhaves, Miss. In exing oil from oil hearing meat and analog substances, the meat is moided into flat se or cakes for introduction into the press, the cakes are wrapped in press cloths to



MACHINE POR STRIPPING OIL CAKES.

hold them intact and subjected to pressure. The press cloths envelop the opposite flat side and that two ends of the cakes, the ends of the cloth core in the content of the cloth core in the cloth cather to an end of the cloth cather to anciently to the cloth after pressure, and must be forcibly stripped off. The present machine expeditionsly removes the cloth without damage either to the cloth or the clo

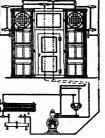


window and door jambs which will dade th ends and cut pockats and pulley openings spitaneously. Another object is to provide doce which will work on right and left abs at the same time.

amos at the same time.

REFRIGERATING MACHINE.—J. J.

SCHARD, Waco, Tox. This invention is an
mprovement in refrigerating machines, and
as for its aim the provision of a simple de



REFRIGERATING MACHINE.

vice of the character specified, adapted to be operated in connection with an ice-making ma-chine, wherein the device is cooled by air cir-culation, the air lielug cooled during the circu-

AIR SUCTION AND PORCE PUMP .-- F. O.

AIR SUCTION AND FORCE PUMP.—F. O. SHITMER, 2835 W. HOUSEON R., San Antonio. The Market State of the Complete Sparstram, a combined passanger and force pump for raining water from wells, the same intended and adapted for service in and-force pump for raining water from wells, the same intended and adapted for service in an eccessary feature of an air-pump rejinder having a reciprocating piston, and possessing certain advantageous features and end cylinder forms the analyses of the service of an air-pump rejinder having a reciprocating piston, and possessing certain advantageous features and end cylinder forms the analyses of the present application. TUBE COLINION MACHINE—J. R. Lewis, and the service of any filling material in the tube; and the service of any filling material in the tube; and the service of any filling material in the tube; and the process, this impacting to the same a desirable degree of hardness or tamps, so that the finished cells are not easily dented or distorted by anbequent handling.

#### Railways and Their Acces

Hallways and Their Accessories. Hallways and Their Accessories. Hallway Hydron Device—A. Wankan, care of same. Box 231 Portage Pathelingues and the same and the

nais within the calcitself will indicate the condition of the track

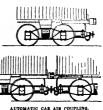
dition of the track
HALIRGAD SPIKE—A. F GORIN, 1230
Remsen St. Brookin, N. Y This lawsuce
provides a spike having means for receiving an
expectation of the spike spike spike with the naterial in which it is driven,
at a point below the surface of and material;
provides a spike having means for preventing
axial movement, or twisting of the same when
driven, and provides a spike, wherein the body
section conforms with the concentional spike.

section conforms with the conventional spike.

AUTOMATIC AIR COUTE/ING -- F N Finst.

B. Columbus, Kan, care of N T Alliano,

Atty at law, Columbus, Kun. The object here is to provide an air-coupling supported by the cer trucks, and in position to be automatically engaged when the cars are united and automatically discusped when the cars are un-



coupled, and wherein means are provided for lasuring a correct air connection, whether the cars he on straight, curved or neven track, the control of the control of the control of the the attrempting of such car with cars not so provided.

Fertaining to Herraction,
FIENTIES SIRED—J. C. Misten, Bidgway, Pt. This improvement provides a side
having a positive steering apparatus so as to
facilitate the taking of sharp curves. A further
object is to improve the general construction
of sides of this type, with particular regard for
minimizing the number of the parts.

#### Pertaining to Vehicles

Pertaining to Vehicles,
and Rw. Boad. A. Active, ere of the latter,
and Rw. Boad. A. Active, ere of the latter,
and Rw. Boad. A. Active, ere of the latter,
wheels for use in temperarily receiving the
seath from a grave preparatory to the intriment of the dead so that such earth may be
temporarily receiving the
seath from a grave preparatory to the intriment of the dead so that such earth in any
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note has reached a predeterulard speed.

SWIVEL LAMP HOLDER—C. N. Rownes,

264 Sherbourne St., Toronto, Canada in the
present justom the invention has reference to
turned in the direction in which the vehicle
is turned, so that if the vehicle is turned, so that if the vehicle is turned, so that if the vehicle is turned, so that if the vehicle is turned, so that if the vehicle is turned, so that if the vehicle is turned, so that if the vehicle is turned in the property of th

Norm.—Copies of any of these patents will be furnished by the SCIENTIFIC AMERICAN for ten cents each. Please state the name of the patentee, title of the invention, and date of this paper.

We wish to call attention to the fact that we are in a position to render competent services in every branch of patient or trade mark work. Our staff is composed of mechanical, electrical and chemical experts, thoroughly trained to prepare and prosecute all patient applications, irrespective of the complex nature applications, irrespective of the complex nature applications, irrespective of the complex nature applications, irrespective complex nature called technical, or scientific knowledge required therefor.

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## Why the Highest Priced Cars All Have Warners

THE Warner Auto-Meter is associated with more high-grade and high-priced cars than any other automobile accessory in the world.

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This is a logical, natural situation because the Warner costs double the price of other speedometers. And the Warner costs double the price because of the exacting manufacturing methods by which it is built. The finest watches, laboratory and scientific instruments are given no greater care in their making.

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ase	Fiat	Moon	Seitz	Winton	
entury Electric	Gabriel Truck	Multiplex	Simplex	Zimmer	

A A A B B B B B C C C C

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#### Logal Notes

Copyrighting Meving Pictures.—Since the institution of the law last summer for 1,055,703, Jacob the protection of moint pricetures, only in a Massellies, in the neighborhood of 900 applications for formed from a sit copyright registration for the subjects paper. In making manad have been filed. Under the law formed deem as mansed have been filed. Use the application for registresism must be accompanied by the title and description, together with one print taken from each scene or act of a motion picture photo control at title and description ot less than two prints take ure other than a photo play.

Continuing Applications in the Court of Appeals.—In the case of Field v. Colman, the Court of Appeals of the District of Columbia in its decision refers to the question of continuing applications. The right of an applicant by multitude appli-cation, to relate back to the date of filing cation, to relate back to the date of filing the first application for reduction to practice, is held to depend breadly upon whether the substituted application is for the same invention as that disclosed in the original application; not that practical disclosure of the first and acceptance of the content specific disclosure of the first and second applications may be different, or even patentably different, if generically they relate to the same invention.

Some Adjudicated Patents.—In National come auguneated Fatents.—In National Casket Company v. Stolts, the reissue patent No. 12,750 (original number 619,-567), issued to the National Casket Company for a gause face plate for burial caskets has been held devoid of invention and invalid. The Hildreth patent, No. and invalid. The Hildreth patent, No. 823,284, for a cendy-pulling machine, has been held void as to claim 4, as broader than the invention in Hildreth V. Laure & Suter Company. The Fishel design patent, No. 37,005, for a design for clasp pin has been held not infringed in Fishel, Nosler Company V. Fishel & Co. and the Fishel patent, No. 384,979, for a jewel bur has been held infringed in Fishel, Nosler Company V. Fishel & Co. Month of the Fishel patent, No. 384,979, for a jewel bur has been held infringed in Fishel, Nosler Company V. Fishel & Co.

Adjudication of Hot Water Heate Patents.—In Rund Manufacturing Com Patenta.—In Rund Manutacouring Com-pany v. Pittsburgh Water Heater Company (U. S. C. C. A.) the Rund patent, No. 761,409, for a gas burner has been held valid and infringed and in Rund Manufacturing Company v. Pittsburgh Water riester Company the Rund patent, No. 903,007, for a water bester has been held valid; also intringed as to claims 3, 5 and 6, and not infringed as to claim 10.

Assignee's Right to Prosecute Applica-tion.—Commissioner Moore in az parte Kyle has held that a petition by an assigned of a part interest to intervene in the pro-secution of an application will be dismissed where not accompanied by proof of service upon the other assignees and upon the

A Design Declaion.—In the case of az paris Fulda, Mr. Commissioner Moore hald that where a design is for the form or configuration or involves the relative per-portions of paris of an article of manu-facture, such article must necessarily be disclosed in the application, but where the design is for an ornament adapted to be applied to any article of manufacture it is not necessary that applicant disdoms the applied to any armote of manufacture it is not necessary that applicant disclose the design as applied to some particular article of manufacture. In the decision the Comor manuracture. In the decision the Com-missioner says while it is possible that applicant might obtain protection for his design under the copyright act, it is believed he is clearly entitled to the protection

afforded by a design patent.

Extensiveness of Use in Engineering 1997, which related to the species and of or future for the control of the

A Novel French Life Preserver, ports from Havre tell of a life pre-iowned by Mr. Allain Redou of Merchant Marine Service which of a garment shaped like an ordinar, but equipped with inflatable rubbee or tubes similar to the water wings po-vith American children at the se-The crowns are covered with the same material as the vest and each line a rubber tube ending in a pneumatic valve which can be operated by meety blowing into it. Ordinarily the crowns are defiated it. Ordinarily the crowns are canasca and can be worn under a cost without attracting attention. In one demonstra-tion a sallor wearing the safety wat had his legs tied together and a weight of twenty-two pounds attached to his feet ins regs and unquine attached to his is and when dropped into the water had difficulty in keeping above the surfs As yet the life preserver is not on market.

Fereign Artificial Marble .- Consul William J. Pike of Reichenberg, Austria, re-ports that considerable interest is taken in an invention by a citizen of Reichenin an invention by a citizen of Reichen-berg, Bohemia, of a process of producing marble substitutes in imitation of the highly prized Italian, Egyptian and Sels-burg marbles. It is claimed that the pro-duct is strong and is not liable to crack. The artificial marble is made partly by hand and partly by machine, while the cutting and polithing is done by machinery. The process is said to be in operation in Yeans, Berlin, Manshelm and Handwen a, Berlin, Mannheim and Hambi

at is a well-known fact that vermin are attracted by light. A Canada It is a well attracted by light. A Canadian inventor Mr. G. A. H. Muller, has patented as Mr. G. A. H. Muller, has patented an insecticide in which that principle is preactically applied. He has invented a luminous aticky compound or paint, which does the work of the ordinary sticky flypaper in daytime, absorbs the rays of light at the same time, and becomes luminous as night to finish its work of extermination. A Nickel-in-the-Slot Typewriter.

A Nickel-la-the-Sict Typewriter.—Harry Bates of Albaya, N. Y., assigner to Underwood Automatic Typewriter Pay Station Company, of New Forc city, has passented, No. 1,003,048, an apparatus in which a coin controlled typewriting machine is normally out of condition for use and, by the deposit of a wittable coin, can be put into condition for use for a period limited by soloriesty, at the termination of which by clockwork, at the termination of which period the machine is automatically looks or returned to normal condition in which it cannot be operated. Such machines can be seen in many hotels.

and be seen in many surveus.

Aid to the Study of Musical Compositions.—In a patent, No. 1,088,569, Percy
F. Cowing of New York city provides a
means for the study, of musical composimeans for the study of musical compositions which includes a record for automatic mechanical instruments. This record is divided into socious or metric, means being provided with matter descriptive of the sections and means being also provided with means being also provided with means and means being also provided subjects to the sections and means being also provided subjects to the sections.

## Why Repair Shops Keep Busy

No wonder automobile repair shops have so much to do, for— The automobile is the most severely used piece of machinry in all the world.

- -It suffers the most and worst shocks and strains.
- -It receives the least expert care in operation.

Because of this, the automobile ought to be the most carefully usigned and the most carefully built machine in all the world.

But it is not, in most cases.

#### Here Are the Plain Facts

Four-fifths of the makes of cars on the market today are neither designed nor manufactured by their so-called makers. They are not even designed as complete, unified cars, but are collections of many groups of finished stock parts—bought here and there, wherever they can be secured most readily and cheaply.

It is nearly a miracle if these parts happen, in any instance, to form a balanced, harmonious, durable, complete car—for these parts, remember, are designed and finished, not for some one particular car, but—

- -as separate, unrelated units,
- -by separate, unrelated groups of men,
- -in different factories,
- -at different times
- —these designers having no knowledge of what other parts are to be used in any particular car assemblage.

#### 80 per cent.-Think of It

Eighty per cent. of American automobile "makers" are gatherers and assemblers of finished parts, made under these conditions. That is the cheapest method of "manufacture." Futhermore, it is a method not practiced and not countenanced in any other branch of the machinery-producing industries.

Locomotives, stationary steam engines, electric motors, machine shop equipment, printing presses—machinery that men buy with careful judgment and at big prices—are manufactured (not assembled) products. They we got to be designed and manufactured as ONE UNIT in order to have precise balance, and uniform strength and endurance, to withstand severe use, to be right. A railroad would refuse an assembled locomotive as it would refuse lead rails.

#### Only One Safe Method

Machinery manufacture is an old, stable, and experienced industry. And the machinery industry says that the only safe way to build an enduring product is to have that product designed and man-

## **WINTON SIX**

Long stroke motor, left drive, center control, electric lights, self-starter, finest mohair top, easily handled curtains, rain-vision glass front, best Warner speedometer, Waltham eight-day clock, Klaxon electric horn, rear tire carriers, four-cylinder tire pump, demountable rims, full set of tools, German ailver radiator, metal parts nickel finished. Fully equipped, \$3250

ufactured under the roofs of a single plant, and to have the whole work supervised by some one richly qualified and able man.

The principle is as old as the hills. Three hundred years ago, Descartes, first of modern philosophers, wrote: "There is seldom so much perfection in works composed of many separate parts, upon which many different hands have been employed, as in those completed by a single master."

#### Here's A ONE-UNIT Car

The Winton Six stands out as a distinctively and enduringly excellent automobile because it is produced on the same plan that the greatest and ablest of machinery makers adhere to so zealously.

It is designed and manufactured in one comprehensive plant. That plant has but one product—the Winton Six car, made in one single model.

Every part of the car is designed and manufactured to harmonize and co-ordinate with every related part.

From start to finish, the production of Winton Six cars is personally supervised by one man, Alexander Winton, founder of the gasoline motor car industry in America, and the world's most experienced six-cylinder specialist.

#### What's the Result?

That's why the Winton Six, alone, was able to change highgrade demand from four-cylinder cars to Sixes. That's why the Winton Six withstands the hardest of service and holds the world's lowest verying reports record 22 cents are 1000 miles.

world's lowest repair expense record—29.2 cents per 1000 miles.

That's why the Winton Six is the finest possible specimen of ONE - UNIT Construction, which means that it is precisely the kind of car that fully satisfies the most exacting purchasers.

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Be careful in selecting

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That's what men always say, when tortured by itchy, scratchy wool, or

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Improved

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For in this Patented scientifically-knitted under you get All the Comfort of softest cotton with All the Warmth of finest wool.

Two Separate, distinctive fabrics—the inner of cotton and the outer of wood—are skillfully united in a single DUOFOLD gars

nt, that is actually less bulky, far more marm and confortable than any single winter garment of cotton or wool. DUOFOLD solves the annually perplexing problem of every business man—how to secure utmost warmth with perfect comfort, in heated office and on icy street.

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MARK Cold Drawn Steel Union

money for the owner Every union is a perfect union because there can be no sandholes or similar defects in

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#### A big saving in both labor and money compared with malicable so many of which break or abow defects when they are first put on.

Cold Drawn Steel is not only tougher and stronger than any cast material, but it expands and centracts suits the pape, thus avoiding those troublesome and expensive expansion-leaks that develop in malleable unions because they expand mers slevuly than the pipe, and stretch when heat is applied to the pipe.

#### Don't Rust or Freeze

because sherardized after threading—a process that protects all surfaces, including the threads, from rust or corrosion.

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MAKERS OF
Standard Full Weight Steam, Water, Gas and Line Pipe, Black and Galvanized



The Most Spilonal Source of Poirs

(Concluded from poor 27th.)
The value of the whole group of the ventions lies in these can heat absorbers, which generate the steam required to run the engine from the sun's rays. These heat absorbers and ste

These heat absorbers and steam generators are, in this particular plant, site is number. They are each 200 feet long sind 13 feet wide at the top. They consist of parabolic frames of very light structural from set with mirrors in such a manner that these mirrors catch the sun's light and redect it all on the two sides of the and reforc it all on the two sides of the long folders superanded in that portion of the frame where the sun's light courserges. Every five agare feet of sunlight received by the mirrors are focused thereby upon one square foot of the bolices, thus quin-tupling the light power. However, as the steam pressure is not allowed to go over atmospheric pressure (equal to 212 deg. Fahr.) the temperature of the hollers never goes above 212 deg. Fahr. and the excess heat is transmitted into the water and produces great volumes of low-pres

The hotlers are flat bottomed, and along the top of each runs a 8½-inch diameter steam pipe, which gathers the steam along ole line and carries it from each of the hotlers into the main steam pipe through which it goes to the engine.

The boilers are constructed of cast iron

in the present plant, but in future plants will be stamped quickly and che pleces 12 feet long from steel tubes one

The steam after passing through the engine and doing its work is condensed into water and pumped again into the bollers. Thus the same water is used over and over again, and only the very little needed to compensate for accidental leak ago is auted. As practically no new water is used there is no danger from the boil-ers becoming clogged with mud or scale. High-pressure steam up to 300 pounds

per square inch can be generated by thes limit absorbers, but this is not done, mair ly because at the high temperature of this stram too much heat would be lost by conduction and convection into the surrounding air, and secondly, because, were high-pressure steam used, the boilers would have to be very strongly construct-ed, and cost considerably more money, and necessitate heavier frame construction to carry them than is now the case.

The five heat absorbers carrying the beliers are set in line due north and souti on rollers and gears carried on proper foundation posts of concrete, and are turned slowly from an eastern aspect in the morning to a western aspect in the evening, so that at all times of the day they exactly face the sun, and generate

The very important element of expan sion and contraction was carefully considered in the construction of the heat ab rs, and many trials were made be fore all the disturbances were eliminated.

The boilers are covered with a single thickness of window glass to prevent loss

Sun power can be generated in large lants located in the desert on the border of arable land, and the power transmitted by electricity over large areas.

The construction of the Egyptian sur ower plant is par ularly simple, and power pant is particularly simple, incomply, practical in every way. Any common sugment can run it. Dwing to the heet they ordinary materials are used in its construction, cannot say a sent and and everything is spore greated and

#### The Ten Greatest Inventions

(Concluded from page 1991) resulted in a protest from a number of readers who misunderstood east object in readers who misunderstood eiss' object in publishing the list, and easied as 'eo se-count for including in it mean; insentense that did not full within, the 'spice, at the contest. However, the majority of our readers without minimum we did not indores all of the inventions in the list, and the result of their rote is very

UTOMOBIL

which in their pade best, most reliable ar give dependable service, a quently they are built to and another times the motor the gearing or some other fa choice When y



#### Electric Engine Starter

you may know that the engineer who designed it was not hampered by any of these considerations and that he as therefore selected the starter which he of these considerations and that he has therefore selected the starter which he knows will give absolutely depended service, will be simple for the ear owner to operate, and will require practically no adjustment on the part of his dealers.

You will know that he has considered the fact that the Apico starter is the finished result of twelve years of practical test and development: that it was perfected by the pioneer in the invention and perfection of motor car electric equipment, and built in an ideal and give service at all times.

If you will equip yourself with a knowledge of the starting and lighting question by get-ting our booklet on the subject, it will help you in the selection of that new car.

The Apple Electric Co. 62 Canal Street, Dayton, Ohio

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OMPRADE DYNAMOS. 5

NO AND MOTOR COMMUNICO. Full information from the American Supwhite and des. The

BLECTRICAL MOTORS. Their construction at

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MUNN & COMPANY, Jo 361 BROADWAY, NEW YORK CITY The second of the second of the second



## Are you getting the maximum amount of daylight in your plant?

Or is a large percentage absorbed, swallowed up, wasted, in your ceilings and walls? The difference can be reduced to dollars and cents, in your lighting bills, the efficiency of your employees, the quality of your product.

You can get the full value of every ray of light that comes in your windows and increase your present light 19 to 36 per cent by painting your ceilings and walls with Rice's Mill White Paint.

Rice's Mill White is an oil paint giving a glossy, tilelike finish without the use of varnish. It will not crack or craze under the jar of machinery, and remains white longer than any other gloss paint.

Rice's was the pioneer "Mill White" paint. It made the reputation of the name "Mill White." The special process by which it is made cannot be used by any other paint manufacturer.

## Rice's Granolith

KIGC & LITAMOISTA
A tough and elastic permanent
finish for concrete walls. Becomes a part of the cemen towhich it is applied. One coat
sufficient, unless a gloss is desired. Makes the best possible
primer on inside concrete and
brick for a second coat of Rice's
Mill White Paint, giving a tiletiles, enamed finish at no more

Rice's Mill White is sold direct, in barrels containing sufficient paint to cover 20,000 square feet, one coat. If you have that area of ceiling and wall space to cover, Write for Booklet and Sample Board

Ask for a copy of our booklet, "More Light." Write today

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RICE'S MILL WHITE



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VICTOR TALKING MACH. CO. WELLS FARGO EX. CO. AND SCORES OF OTHERS

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WE HAVE PROOF-ELECTRENE CO.



#### During a Period of Nineteen Months This "Electric" Was Out of Service Only Two Working Days

—and that two days loss was due to other causes than the battery. This battery was an "fronciab-Exide" it was placed er, 1911, and up to April, 1913, had given —an average of about 35 miles per day. is just such continuous, unfailing service as this that makes an ectric vehicle—whether pleasure or commercial—a real delight its owner. And it is just this service that is supplied by



THE ELECTRIC STORAGE BATTERY CO.

## ee Puncture Proof Tires

It is easy to call a tire "an extra service tire." And sometimes hard to find the extra service. But with Lee Puncture-Proof Pneumatics you get

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## The Chronology of Aviation

THE Scientific American has received from Mr. Hudson Maxim and Mr. William J. Hammer, a limited number of the reprints which they have just issued of the very complete "Chronology of Avaston," originally prepared by these gentlemen for the World Almana of 1911. The data enabrace the essential facts relating to serial progress. In addition to a short historical relation, one finds herein tables giving altitude records, speed records, quick starting and slow-speed records, passenger carrying. English Channel and other over-water flights, cross-country flights, notable distance and duration flights, etc. There are also statistics relating to accidents and data relative to pherical and drigible balloons or airrhaps, etc. Of no small interest are the tables giving the most important flights of the Wright brothers. There are doubtless many readers of the Scientific American who are much interested in this subject and who would be glad to secure a copy of this interested in this subject and who would be glad to secure a copy of this interested in this subject and who would be glad to secure a copy of this interested in this subject and who would be glad to secure a copy of this interested in the Scientific American who are much interested in the subject and who would be glad to secure a copy of this interested in the Scientific American who according to the Scientific American who are much interested in the Scientific American who according to the Scientific American who according to the Scientific American who are much interested in the Scientific American who according to t SCIENTIFIC AMERICAN, 361 BROADWAY, NEW YORK

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testante there was a wide diversity of opinion, the vote was not unanimous even on serestes sciepraphy? The following is the result of the vote request to a percen-

Aeroplane	75	4	44
X-Ray machine	74	**	••
Automobile	66	***	**
Motion pictures	63	4	**
Reinforced concrete		,**	••
Phonograph	37	м.	н
Incandescent electric lamp	35	ч	**
Steam turbine	34	**	64
Electric car	34	40	40
Calculating machine	33	**	**
Internal combustion engine	38	**	••
Radium	27	"	"
Submarine boats	24	"	**
Picture telegraphy	24	"	**
Electric furuace	21	**	
Diesel engine	18	*	4
Color photography	17	*	**
Dictograph	16	"	44
Composing machine	15	"	. **
Transmission and transform-			
ing of alternating current	15	"	14
l'neumatic tire	15	••	"
Dirigible	18	"	••
Photo-engraving	13	44	**
Tungsten	11	"	**
Electric welding	10	u	"
High speed steel	10	**	**
Kodak	10	"	*
Fixation of nitrogen	9	"	44
Welsbach burner	9	**	44
l'roducer gas	8	44	44
Monorail	8	"	"
Flexible photo films	7	"	*
Liquid air	7	"	**

There was a straggling vote for the other subjects in the list. Burbank's work received 23 votes, l'asteur's work 20 votes Acetylene Gas from Carbide, 17; Mercury Acetylene Gas from Carlide, 17; Mercury, Vapor, Lamp, 7; and the Preservation of Sugar Producing Plants, 7. In addition to this there were about 60 inventions mentioned which did not appear in our list. The more important of these were the Combined Motion Picture and Taiking Reads and Carling Motion Picture and Taiking Reads and Carling Motion Picture and Taiking Reads and Picture and Taiking Reads and Picture Machine, 10 votes: Edison's Storage Battery, 6 votes; Autometic Player Plano 4 votes; Pulmotor, 4 votes; and Tele phone, 4 votes; while the rest were nearly all represented by a single vote each.

Evidently there is not much disagree-ment about the first five inventions in the list, but after that there is a sudden drop m 63 per cent to 87. It is interesting to compare this vote with the list in the first prize casay. Mr. Wyman's selec-tion of Wireless Telegraphy is indorsed by 97 per cent vote, his Aeroplane by 75 per cent vote, the Automobile by 66 per cent vote, Motion Pictures by 63 per cent vote, the Turbine by 34 per cent vote, Elec tric Furnace by 21 per cent vote, the Composing Muchine by only 15 per ce while the Cyanide Process, the Induction white the Cyanada Process, the Induction Motor, and Electric Welding received scarcely any attention from the readers at large. On the other hand, the X-Ray Machine which polled such a high vote with the renders was entirely ignored by

After all is he not right in rejecting the machine but a Crookes tube and a Ruhm korff coil, both old inventions? Is it no the discovery of the rays rather than the machine that is of an epochai character? But discoveries not patentable are ex-pressly excluded from the contest. What about radium then? Surely the process of producing radium involves invention. of producing radium involves investions. Why is it not patentiable? Why, is not radium chloride patentiable just as are other chemical compounds? Even such subjects as the aeropiane and attemptible are open to question. The judges had to consider the question of whether this internal combination makes with the learned combination makes and the learned combination and the learne ternal combustion motor was not really iternal combustion motor was not really the plones inyention to, which credit should be given for the automobile, and acropiane merely a lite with a motor in it and is not the automobile an ordinary car-riage cutpode with mechanical power? The whole subject is one full of genetics. and consequently of exceedingly gre

by S. S. CLEVELAND 000 tons) from New Jan. 15th, 1914. Th he Mediterranean, Canal, Red Sea and India Ocean to Bombay and Co lombo. Side trips thro India, Holy Land as Egypt. Stopping at point in Europe, Asia and Africa Duration 93 days. Cod

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#### The Heavens in November

(Concluded from eage \$41.)
The last two lines, having been deriv by extrapolation, may be in error by s

half way between a Cygni and the north-ern stars of Delphinus on November 1st about 3 degrees west of a Cygni on the 17th, and about midway between s and of Cygni on the 25th. It will therefore bevery easy to find. Metcalf's comet has been passing southward through the sam region of the sky, and, on the evening of October 22nd, the two comets, according to the ephemerides, came within 40 min-utes of one another—in the same low-power telescopic field—an occurrence so unusual ately the predictions were not published in time to enable advance notice be given in this column.

The Heavens

finding Westphal's comet may be found on our map, well down in the west and northwest, though early in the evenings they will be much higher up. Below Cygnus is Lyra, and Ursa Major and Draco are also low along the northern horizon, while Casslopela swings high above the pole. The splendid winter constellatious have come full into view in the cast and south east-Auriga, Gemini and Taurus, Orlon and the Great and Little Dogs. Perseus Andromeda and Pegasus form a line siretching westward through the zenith while Cetus, Eridanus and Aquarius or cupy the great dull region in the south

#### The Planets.

Mercury is evening star until the 23rd, when he passes through inferior conjunc-tion and becomes a morning star. At the beginning of the month he can just be n in the twilight, setting at 5 50 P. M the dawn, rising at 5:40 A. M.

Venus is a morning star, rising about 6
A. M., and still fairly conspicuous. Maris in Gemini, south of Castor and Polluv orning star, rising about 5 of rises about 9:20 P. M. on the 1st, and 7:40 on the 80th. He nearly doubles in es during the month, and exceeds all the stars except Sirius.

Jupiter is evening star in Sagittarius dropping fast into the twilight. He sets dropping fast into the twilight. He sets at 8:45 at the beginning, and at 7:20 at

Saturn is in Taurns, just approaching NATURE 18 IN TARIUS, JUST approaching opposition, and rises at 6 P. M. in the middle of the month. He appears fully as bright as Capella, and but little fainter than Mars. Uranus is evening star in Capricornus, too low in the west to be il seen. Neptune is right oppos the heavens, on the borders of Gemini and Cancer, and can be observed in the m ing hours.

The Moon

First quarter occurs at 1:34 P. M. on the 5th, full Moon at 6 P. M. on the 13th last quarter at 2:57 A M. on the 21st, and new Moon at 8:41 P. M. on the 27th. The Moon is nearest us on the 9th, and farth est off on the 25th. She is in conjunc tion with Jupiter on the 3rd, Uranus or the 4th, Saturn on the 15th, Mars and Mercury on the 27th, and Jupiter again on the 30th—none of the apparent aproaches being at all close. Princeton University Observatory.

### A Cinematograph Hand Camera

(Concluded from page 846.)

cycle pump in the same manner as if pneu-matic tires were being inflated, the cam-era being placed upon the ground for the The charging valve is pl aced upon the top and is closed with a screw cap to prevent the entrance of dust About forty strokes with an average foo pump is sufficient to produce a pressure of about 100 pounds in the receivoirs, and pumping can be continued as long as de stred, the cylinders being designed to with stand a pressure of 2,000 pounds per square inch. As it is physically impos-sible for a person to theres the cylinders



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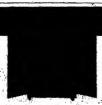
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sever. 600 jounds, as emple margin of mater is provided. Chinging the cytin-dent is an attendately simple straightfor-ward process. the only precention neces-sary being a passe of about 50 seconds when each 500 pounds pressure is attained so as to permit the pump and connection to second warm. The flux boxes are mounted side by side, the unexposed box being pieced in the inseriment position. The film is threaded through the intermittent mechanism in the

through the intermittent mechanism in the itinial manner and returned into the ex-posed film box mounted beside the first box, and upon the eams spindie. The groupops, though small, is of great power, and by its means all small vibrations, such as that produced by the running of the mechanism, the speedy movement of a vahiefe, and so forth, are completely ab-

In operation the camera is held up or the cheet so that the view finder is brought level with the eye, like a rife sight, and in this way one is able to follow the acone, keeping the main features in the center of the picture, with the utmost case. Both hands are free to hold the instrument during exposures, as it is not sary to keep the finger upon the but-When all is ready for exposure the ton. When all is ready for exposure the air valve is opened by turning a small knob. This permits the compressed air to pass to the motor. The latter is unable to salf-starting and the air is unable to eccape. Then, sighting the camera, the starting button is depressed and given a starting button is depressed and given a starting nation is depressed and given a sharp turn. This sets the motor in mo-tion, and it will continue running until a slight pressure is imparted to the button once more, when the mechanism stops im-mediately. Thus one has complete control over the camera, and in photographing topical subjects no waste of film need be incurred. While it is not necessary to close the air valve upon completing each exposure, this precaution should be observed when work is completed, or when the film box requires changing. Although the normal speed of exposure is streem pletures per second, this speed may be varied even while the camera is being used, and the eye is sighting through the view finder, merely by moving the speed

The governing system is very positive and insures that the same ratio of expos-ures and speed of the gyroscope is main-tained when the reservoirs are nearly exhausted as when fully charged.

This camera has been embraced by several well-known cinematographers such as Cherry Kearton, Paul Rainey, and others, who make a special study of making mo-tion pictures of big game in the jungle, where the conditions render the use of the orthodox cumbersome instrument extreme-ly dangerous. It has also been adopted ly dangerous. It has also been adopted for photographing from seroplanes, for which work, where the conditions are cranged, it is well adapted. It is also extremely useful for work in crowded throughfares. In this case a street pro-cession or other incident may be taken without the conventors sensitive and a without the operator's securing an ele-vated position to clear the heads of the people. He merely holds the aeroscope people. He merely house the aeroscope above his head with his two hands, and by means of a special view finder placed on the under side of the camera, he can fol-low the incidents and make the exposlow the increases and make the expon-ures. It is also applicable to studio work in confunction with the ordinary tripod, the mechanical autematic control and drive being very useful at times.

## Air Scouting at the Italian

1 477 HE characteristic note of the Ital-ion grand civalry maneuvers held coward the end of Suptember in the vast Locebard plain was understody the affect tive work done by the serial explorati

provides the Italian corresponder of the Implement to find journal. "Sixthen accombines, using any provided by the Implement to find journal, "Sixthen accombines, sugarly supercised by the secondary." For one of tricked the providings, "For one of tricked jobs from equations and that at hear the provides a contract of the providing of the Implement of the Imple 





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Mante. Four Bidriot mone channels. Four streets appropriate the first blauvice Farming, blauping them, all logisd to the said again, smalle as square hundred to the blue forten together with four Nauport monoplates. Buth unit was aged by a pilot and an 'obe

"The results were eminently as tory, nor was the work interrupt the persistent rains, heavy clouds, and string winds. On one occasion two Bistis monoplanes were sent to reconneitre and returned after two and a half b bringing back photographs and precise in formation which enabled the commander of the red army to determine the numbers of the red army to determine the numbers, formation, positions, and movements of the entire Vercetiff—histo-division then Warrching on Milan From Pieconia and Pavis. One of the machines had flown SO kitometers (1745 miles) per hour. This speed represents, in the opision of the officers of the biplane section, an almost excessive limit for accurate observation. Those gentlemen, in fact, hold that the biplane, traveling at 100 kitogrammes (62 miles) per hour, is the ideal machine for military work, since it has the advantage of maxiwork, since it has the advantage of maximum stability and offers greater facilities to the pilot for seeing immediately beneath

"The airship performances seem to have been what many expected. Their demerits appear to have been brought out on more than one occasion, when the heavier craft was seriously mensits more active rivals.

"In more active rivals.
"In view of the fact that knowledge of
the various types of aeroplanes is not as
yet-generally diffused, and in order to prevent confusion between friend and foe, the military authorities adopted the almple plan of distributing leaslets with rough in dications of the salient points and outline sketches of the different aeroplanes taking part in the maneuvers. The Maurice Farman biplanes which served with the 'red forces were marked to distinguish them from those of the opposing side, with a large black circle and another in white

#### The South American Meat Industry

THE stock-raising and meat industries of South America are well developed and have large possibilities for future extension, according to Dr. A. D. Mel-vin, chief of the Bureau of Animal Industry, who has returned from a tour of in-vestigation made by direction of the Secretary of Agriculture.
While statistics show that Argentina is

already slaughtering up to the limit of its present stock of cuttle, Dr. Melvin was impressed with the great resources that country for cattle raising and be-lieves that it will be possible for the stock raisers to bring about a large increase in the meat output if present prices are maintained.

The cattle slaughtered for export in A gentina, Dr. Melvin says, are fed no grain whatever, but are raised and fattened entrely on aifalfa pastures. For the most part the cattle are high-grade stock, the predominating breed being the Durham with the Hereford ranking second and the Polled Angus third in number. The airalia pastures are capable of supporting many more cattle than are the native "camps" or unbroken country. In a general way the cattle raisers estimate on 21/4 acres of pasture per head for growing 2½ acres or pasture per near for growing cattle, and 3 to 8½ acres for fattening cattle. These pastures support the cat-tle the year round without any further feeding except in occasional times of drouth or invasion of locusts.

drouth or invasion of locusts.

"At the time of my visit," mays Dr. Melvin, "cattle that dressed 850 pounds were
odd for \$74.00 gold. This grade of Argontine beef, which is of very kind qualities
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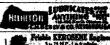


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#### THE WEEKLY JOURNAL OF PRACTICAL INFORMATION

VOLUME CIX ]

#### NEW YORK, NOVEMBER 8, 1913

PRICE 10 CENTS

## The Electrically-driven Vessel "Tynemount" By Frederick C. Coleman

THE first ocean-going vessel directly driven by electricity has just been completed at Wallsend-on-Tyne, England, and is about ready to cross the Atlantic Ocean for service on the Great Lakes. The operation

en the reasel will be watched with great interest, for although the same type of propulsion was used on the small "Bleetric Are," the latter is not to be compared with the "Tynemount," which has a length of 250 feet, beam 42 feet 6 inches, moided depth 19 feet, and a cargo capacity of 2,400 tons.

The propelling machinery of he "Tynemount" is accommodated in a compact engine-room under the poop of the vess l, and occupies only about one sixth of the ship's length. On opposite sides of this room are two six-cylinder Diesel engines, each capable of developing 300 brake horse-power at 400 revolutions per minute. Direct connected to engine is a 8-phase gener ator furnishing electric power to an induction motor mounted directly on the propeller shaft. The rectly on the propener shalt. The siternators when running at their normal speed of 400 revolu-tions per minute each give an output of 500 volts and 270 amperes per phase, which absorbe the full power of the en exciter is direct coupled to each alternator and is capable of giving an exciting current of 30 am-

market Marine

peres for normal working, which can be increased up to 50 amperes while maneuvering.

In ordinary practice where two alternating-current generators are connected in parallel it is necessary that they be run up to speed, and be synchronized before being switched on to the load. But such an operation would be imparcitable in ship work. Accordingly, a very ingenious arrangement has been adopted. The two generators are provided with six and eight poies, respectively, giving a frequency of 20 and 20.6 cycles per second, respectively. The rotor of the motors is of the well-known squirrel cage type, but the stator is provided with two entirely separate windings, one of thirty and the other of forty poles. When these two wind-

ings are supplied with current at 20 and 20.6 cycles, respectively, they give the same synchronous speed of 80 revolutions per minute. The motor then absorbe the full power of both engines, and drives the propeller to which it is directly coupled at a speed of 78 revolutions per minute. To obtain a lower speed, the conscitions are altered so that the 20-cycle generator supposting the contractions are altered so that the 20-cycle generator sup-

View of the engine-room, showing one of the generating sets.

piles the 40-pole winding of the motor, while the 20.5 creis atternator is shut down, thus throwing the 30-pole winding of the motor out of errice the superior winding of the motor out of errice the year of the superior of the superior winding the superior wind

never run in parallel, so that it is immecessary to synchronize them. The motors are readily reversed by interchanging the connection of the two phases

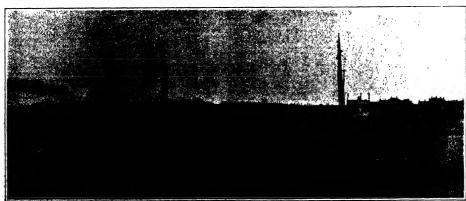
The switch genr consists of a controller having five different positions, full speed ahead, half speed ahead, stop, half astern, and full ustern, while a second switch is employed for the purpose of introducing resistance

into the shaint circuit of the exciter. The continers of both switches work under oil, but it is madylsable that the continets on the main switch should be required to break the large main current flowing to the motor. The two switches are therefore interlocked, so that it is laugustable to work the main switch except when all the resistance has been furtheduced but the except when all the resistance has been furtheduced but the exciter field cell. There is then whole system is dead. With the resistance in the calcute teller cut, the main switch can be moved to any one of its of the and working positions, and when the main connection has been audit on the main connection has been main connection the short switch level is pulled over, so as to cut off resistance and restores occupation.

and restore excitation.
It will be seen that the whole handling of the ship can be enried out by means of two levers which are so hierbicked as to be practically footpreaf. In the present instance these switches are in the engine room, but it is evident that by lengthening the connecting eniles they could be placed on the navigating bridge,

The number of electrical instruments provided has been kept down to a minimum. There is only one animeter and one voltmeter for each atternation and an ammeter and voltmeter for each excite. The landfling of the switch goar is so simple that there is no neces-

sity for multiplication of measuring instruments. The electrical drive allows of a reduction in the machinery space and also in the bunker space required, thus increasing the eargo empachy of the vessel. As a subsidiary advantage, it leads itself results to distant control, and in may case where II may be found advashibe the switchigen can be put out the bridge, thus placing the cantrol of the motor driving the propelle into the lands of the nativating officer.



The "Typespecial," a freighter for the Great Labor, driven by electricity generated by two Dicael-augme-alternator ects.

Here the oak funder along the sides for protestion in the locks.

#### SCIENTIFIC AMERICAN

NEW YORK, SATURDAY, NOVEMBER 8, 1913 ed by Munn & Co. Incorporated. Charles Allen Munn Frederick Converse Beach, secretary and Transurer all at 81 Broadway, New York

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The Editor is always giad to receive for examination illustrated articles on subjects of timely interest. If the piotographs are surely, the articles short, and the facts nutleutic, the contributions will receive epecial attention. Accepted articles will be paid for at require space rates

The purpose of this journal is to record accurately, simply, and interestingly, the world's progress in scientific knowledge and industrial achievement.

#### Scientific American's Contribution to the

Development of the Racing Aeroplane T the time of the acropinue meet which was A held on Long Island in the autumn of 1910, the Editor of the SCIENTIFIC AMERICAN undertook to forecast the line of development which would be followed in the designing of future racing aero-planes. In an article published in our issue of October 22ud, 1910, we wrote: "A study of the trend of de opment in aeroniane construction renders it possible predict, with some degree of certainty, the leading characteristics of the aeroplane of the future, and especially of that type which will be built purely for racin purposes." Our design was based upon a recognitio of the fundamental principles: that the chief resist-ances encountered by an aeroplane are those due to the lift and the head surface, or total projected vertical a, and that while the resistance due to the former is fairly constant, the head resistance increases approximately as the square of the speed, and that hence it is necessary in a racing machine to reduce the head resistance to the least possible limit consistent with structural requirements

We puinted out that this consideration of head resistance ruled out the hiplane because of its mass of struts and wires, and rendered it necessary to design the monoplane strictly in accordance with the stream-line theory of resistance, that it necessitated the abolitime theory of restance. That it increasingted the about tion from the monoplane of external sirnis and guy-wires; the adoption of a body of torpedo form; and the countraction of planes of sufficient thickness to admit of building entirely within their external surfaces internal girders or frames having sufficient trans verse strength to prevent buckling and hold the wings up to their work. It was suggested, moreover, that the body and wings, as thus modeled, should be built of some high grade steel alloy, such for instance as vanadiam steel—a construction which the rapid development of the tensile and other desirable qualities of alloys promised to render possible in the ear future Furthermore, it was predicted that such chine, provided with a Guome motor of from 75 to 150 horse-power, according to the size of the un-chine, would be capable of making speeds of from 100 to 125 miles an hour

So much for prediction The event has proved that, in the technical world at least, prophecy based upon a recognition of fundamental scientific laws cunnot go a recognition of tundamental scientific flows cubinol go very far wide of the mark. This is shown by a study of the whining machines in the three contests for the Gordon Bennett Cup which have taken place since this orticle was published

The Nieuport monoplune, with which Weymann cap-tured the cup for America in the 1911 meet held in England, was built in accordance with the streamline theory, the long, tapered fuselage being entirely covered in with fabric With a motor of 100 horse-power, this muchine easily surpassed its competitors, averaging 78 i miles per hour, as against 75.9 miles per hour made by riot of equal power.

In the meet of 1912, the winning machine, a Deper dustin monophine, which covered the course at a speed of 106 miles per hour, showed a still closer approximation to the Scientific American type. The body, of torpedo form, was sheathed in with a smooth coat of thin, laminated wood, and although the struts and gur where were still present to be acceptable. wires were still present in the machine, they had been cut down to offer as small a head resistance as then was thought practicable.

In the race for the cup held in France on September 20th, 1913, it is significant that a speed of 125 miles

an hour, predicted by us in 1910, was achieved by a machine which bears a remarkable like pictured by us at that time. Not only is it of true pictured by us at that time. Not only is it of true torpado form, but the construction of the wings and the running gear shows evidence of a further effort to re-duce head resistance and eddy making. The struts for the overhead guy wires are very low; the whoela are sheathed; and the frames in which they are car-ried are formed with a cross-section calculated to no. ried are formed with a cross-section calculated to pre-

ried are formed with a cross-section calculated to pre-sent as small wind resistance as possible.

In one respect our prediction as to the form of the future aeroplane has proved to be wrong. Basing our expectation upon Langley's experiments, we believed that the wings of the future racer, like those of the that the wings of the turns racer, has those of the albatross, would be long and narrow. Experience has proved that better results are obtained with a wing that is relatively short and broad—and this, by the way, is strictly in favor of the construction of wings ree from guy wires, in which the proper transverse strength is afforded by girders placed entirely within the wings. The bending stresses in wings of a given shape increase proportionately to the length of the wing; and if the wing area were so distributed that the wing had a greater width at the body than at the tip, it will be possible to secure sufficient girder depth tip, it will be possible to secure sufficient girder depth for strength, and still retain the flat curve which has been found to give the best results at speeds of 100 es an hour and over.

Prevost's winning machine differs from that sug gested by the Scientific American, furthermore, in the fact that we provided a pneumatic cylinder and con-nections, by means of which the running gear could be folded back against the body of the aeroplane as soon as it took the air. We are still of the opinion that such a construction is practicable. If it were adopted, the total head-on resistance would be very greatly de-

It is of interest to note, in passing, that we for the Scientific American machine of 1910 the use of a pneumatic cylinder, placed transversely to the ho of a paeumatic cylinder, placed transversely to the body, for operating the wing thys, the valve of the cylinder to be controlled by a small gyroscope. This device is uow being used on our army aeroplanes, and is being extensively tried out on many European machines. In the year 1911, an Antoinette machine entered the

ary contest in France, and this aeropiane was enlirely self-contulued; that is to say, the struts and guy wires were abolished and the running gear was low and housed practically within the body. Unfortunately this numerine was altogether too large for its power, and the great length of the wings necessitated their being nearly two feet thick at their junction with the body. Had Antoinelte machine been built smaller and of metal, and provided with a Guome engine of greater power, lieve it would have swept the field.

At the close of the recent contest for the Gordon Bennett Cup, it was predicted in some of the French impers that no further contests would be held; but we caused believe that America will permit the famous trophy to remain unchalleuged in the hands of the French people. Prevost's 125 miles an hour can be beaten, and can be beaten by a machine huilt in this country. If the gry wires, etc., of Percon's machine must be bedy somewhat lengthened, and "fined out," and the rouning gear made foldable against or entirely within the body, it is our belief that its 160 horse-power Guome engine would take it around the same course at a st approaching 150 miles per hour.

#### Completion of a Great Engineering Work

HE completion of the Los Angeles aqueduct, as described elsewhere in this issue, marks the successful ending of an arduous struggle with na ture in its most rugged aspects of mountain and desert and with powerful and subtle private interests for the possession of a priceless supply of water. The ten aqueducts of ancient Rome were marvels of engineer-ing skill and durability; but their construction stretched one can mus curamity; but their construction stretched over a period of five centuries, against the eight years that have elapsed sluce the Los Angeles aqueduct was first proposed, and the length and dimensions of the ancient Roman aqueducts bear no comparison with that of modern Los Angeles. The longest of the Roman aqueducts was 62 miles, while the Los Angeles aqueduct is 254 miles in length, from the intake on Ov is 254 miles in length, from the intake on Owens silver to the city limite of Los Angeles. The firfgation adju-ducts of the Inca Indians of ancient Peru, one of which was 360 miles long, are among the wonders of the world, especially so when it is considered that they were constructed by a people uninformed as to modern engineering science and its methods, but these prob ably exhausted centuries of time. The 850 miles of iron pipe line, 30 inches in diameter, which conveys water across the arid plains of western Australia to the gold mining districts of Kalgoorlie and Coolgardia is one of the triumphs of modern constructive hydraulic engineering; but this construction, although in a bot and waterless country, was comparatively level, while the Los Angeles aqueduct bores through miles of mosa-

tains of solid rock, cross es valleys on pillars crete in some places, and through hope steel sig

notable Australian structure.

The great Ashokan aggeduct to supply the city of New York, now in course of construction, is the only modern hydraulic entesprise insended mainly for denseste and industrial true, that compares fairly with the Los Angeles aqueduct. The New York aqueduct crosses the Hudson over a thousand feet beneath the river bed, and it will furnish the metropolis with 500,000,000 gallons daily at a cost, including its various reservoirs, of about The Los Angeles aqueduct has not much more than half the canacity, it is true; but it is about more than hair the especity, it is true; but it is about twice as long, passes through an incomparably rougher country, and its cost, when completed, will be less than one fifth that of the great New York enterprise.

#### Safety at Sea

THE Committee on Aids and Perlis to Navigation formed by Secretary of Commerce Reddeld to prepare recommendations for the use of the American delegation to the London International Conference on Safety at Sea to be held in November, recommeans that all occan-going stemmer, securing means that all occan-going stemmers, equipped with electricity, shall carry a searchlight so placed as to illumine all polars of the horison as far as practicable, and of sufficient power to distinguish a ship's 24-foot boat at a distance of not less than one nautical mile boat at a distance of not less than one nautical mile on a clear dark uight; and that all light vessels on im-portant outside stations shall be equipped with sub-marine bells, and all ocean-going vessels shall be pro-vided with means for detecting submarine-bell signals. committee recommends, furthermore, that the Inter-nal Rules of the Road be modified so that carrying of range lights shall be obligatory instead of op-tional, as at present, and that all vessels shall also nonzi, as at peacer, and that all vessels shall also carry a fixed stern light. The International Rules should also be amended to provide that every vessel navigated in the vicinity of icobergs or ice flows during darkness abould go at moderate speed, having carrial regard to circumstances and conditions. The use of rockets showing red should be restricted to distre

In the interests of the future development of radio-neteorological services, the committee recommends that the existing meteorological service of each administra-tion adopt as part of its programme the organization of a radio service for the coastal waters pertaining to that administration. It is further recommended that meteorological observations be made, at Greenwich moon, whenever a vessel during the preceding four hours has experienced a barometer reading below 30 juches and failing continuously, or has discovered other symp-toms of approaching storm. That class of meteoro-logical information which transcends all others as regards its value to shipping is the storm or hurricau ng, particularly the latter. The committee consid warning, particularly the latter. The committee considers this warning service as promising more beneficial results than the project of distributing warnings to vessels in mid-ocean, and therefore emphasizes the importance of concentrating all means at the command of meteorological services on the development of an effi-cient warning service for coastal and suhtropical waters. The United States Naval Observatory has developed a time service by radio which has proved of great value to shipping, and the committee recommends a counid-eration of the desirability of requesting all governments to establish a like service.

For many years the important steamship lines tra-ersing the North Atlantic Ocean between New York Philadelphis, Boston, and the ports of Europe have agreed among themselves that their vessels should hold to certain prescribed lanes. This plan should be broadened by making the steamship lanes obligatory to steamships. Governments should pass legislation requiring the steamships under their respective flags to strictly to steamship lanes prescribed by them.

In recommending that an International Ice Patrol be established, the committee suggests that the annual established, the committee suggests that the annual responsibility and expense of maintaining this patrol responsibility and expense of maintaining this purely be assumed by each of the several maritime nations in turn, the partol to be conducted in accordance with a general plan to be formulated and agreed to by the several maritime nations concerned at the International oe. The ice patrol shall begin April 1st of each year and continue until the ice ne longer constitutes se to navigation in the sone of the transatiantic a memore to havegation in the sone of the transatinatic steemability lane. At all times during the continuance of the patrol there must be at least one vessel present in the technique section. The committee also recommends that an endeavor be made to reach an agreement with the several maritime nations interested in the transthe several maritime nations interested in the trans-atiantic trade, as follows: The United States to con-time the destruction or removal of deresions in the North Atlantic west of a line drawn from Cape fishel to latitude 34 degrees longitude 70 degrees, and thence to the Bahamas, and other maritime nations to main-tain a suitable vessel or vessels for the purpose of de-stroying or removing deresions each of said line.

#### Electricity

The second of th

Telegraphy from an Aeropiana.—Long distance virapian feligraph experiments recently made from a Bequegeroplane to a ground station at Doual, France, showed
excellent results. The seropiane is a three-exacted fyersetagrafe for the government of Siam. With Moineau
piloting and Engineer Roques operating the viraless
apparatus on board, the seroplane lept on its flight
from the serodrome and sent messages every five minutes
to a land station in the town of Doual. The musical
wave method was employed, and it is olatimed that
messages outle be beard with the seroplane as far as
60 miles off, in spite of the small power used in the
apparatus on board.

Three-phase Italias Ballroad.—In Italy there has lately been put in operation a line of electric road which, although a short one, is of interest on account of the direct use of three-phase current at 42 eyeles. The line is laid from the quarries of Basco to the rail—road station of Bagni in the neighborhood of Rome, and its length is some 7,000 feet. The three-phase current comes from the Laxifiel electric station and is delivered by a line working at 11,500 volts, this being reduced by randformers on the spot to 500 volts for operating the electric railroad. Simal electric locomotives have 30 horse-power motors of special three-phase design on the Brown-Boveri system, which draw \$35-ion rook trains.

Ment Blane Tearist Lines.—The first of the tourist lines in the region of Mont Blane was the electric road from Fayet to Chamonic, which was opened in 1901 and extended some years later to the Swiss Tearist, where it joins the Maritgny-Chabeland electric road, thus connecting the Arve valley with the Federal rail-road. The popularity of these electric road is shown by the fact that it times as many passengers are carried now as in the first period. This great movement led to several projects for mountain lines, and one of these is now completed, this being the steam rack-rail from Chamonix up to the Mer de Glisce, opened in 1904. Another new line partly in service, is the rack-rail from Chamonix up to the Mer de Glisce, opened in 1904. Another new line partly in service, is the rack-rail from Chamonix up to the Mer de Glisce, opened in 1904. Gouter. It is to be extended further up the mountain to a point near the summit. At present the road is constructed only as far as Mt. Leohat. There is also in construction an aerial cableway up the mountain from Palerius village to Col de Midi and Ballée Vlanche. A recent project calls for an electric road from Chamoniz to Mont di Couvercia.

The Julienbuitte Rolling Mills in Germany afford a good example of an iron works which amplicy electric motors almost exclusively, using current from industrial mains. The reversible rolls are operated in this case by an electric motor designed specially for the severe shocks of this class of work on the Allgemiche-Hgases system. Such motors are not supplied directly by the incurrent, but in order to take up the shocks an intermediate machine is used in the shape of an Hgase converter. This group receives three-phase current from the electric mains at 6,000 volts and 50 cycles. It has two separate halves, each being made up of a three-phase motor for driving a dynamo in order to threshose motor from the million of the current supply. In standard practice the two dynamos are coupled in series and furnish current to the two 1,800 horse-power motors of the rolling mill; these two motors having their circuits also connected in series. The present mills furnish 50 to 80 tons of rolled metal per hour. We may also mention that three large motors of 2,000 horse-power size are in use in the tube rolling mills of Elemarckhitte.

Corpuscies Emitted by Alkaline Metals.—Prof. J. J. Thompson brought out the fact that corpusoies are emitted by alkaline metals under the sotion of light, and the effect feebly substate in the dark. The question has been the object of research on the part of various scientists, which Herirot resumes as follows: The action is seen in the two metals potassium and rubidium, and the effect is analogous to radio-activity. Potassium gives of  $\beta$ —rays which are homogeneous and easily deflected by the magnetic field. Their penetration is about like the  $\beta$ -rays of maxim. As regard rubidium, it also gives of  $\beta$ —rays which are slower and rather homogeneous, and as to absorption they resemble the  $\beta$ -rays of radium. It appears that potassium and rubidium is nease smit charges spontaneously which are in part due to ionizing  $\beta$ -rays. The entirence of serve charges could not be seen. L. Dunoger and E. Miller consider this effect to be due to obscure heat rays and not to radio-activity, and is a photo-electric action set up by the infra-red rays. Woodrow measured the potential and considers the action not a Volta effect but a spontaneous emission of corpusales like what redio-action produces. Rowwer, as H. Thirring olimns it to be due to the Volta effect and that such cells set like gairance colls, it will be seen that the question is far from being settled.

#### Trience

Botsaic Garden in South Africa.—The Parliament of the Union of South Africa voted at its last session to establish a large botanic garden at Kirstenhosch, a farm on the Rhodes estates, to the south of Groots Solur, on the castern alopes of Table Mountain. Prof. H. H. W. Pearson has been appointed director.

Zinner's Comet.—A cablegram received at Harvard from Kiel gives the following position of Zinner's Comet as observed by Graff at Bergedorf: October 24.2687 G.M.T.

R.A. 18 hours 45 minutes 53.7 seconds.

Declination—5 degrees 23 minutes 23 seconds.

The comet was visible in a small telescope.

The comet was visible in a small telescope. Free Radium.—Dr. Charles L. Parsons, chief of the Bursau of the Division of Mineral Technology of the United States Bursau of Mines, announces that through the generosity of Dr. James Douglas of New York orty, and Dr. Howard A. Kelly of Johns Hopkins University, twenty-aeven elaims of mining land in Paradox Valley, closurade, have been purchased, said to be the greatest radium bearing ore deposit at present known. The National Radium Institute has been incorporated to work the deposits. The entire undertaking is under the supervision of the Burseau of Mines, and all the radium will be at the disposal of physicians free of charge.

Harvest Weather Forecasts.—This name is applied in Great Britain to telegraphic weather forecasts for forecasts, and the state of the Medical Performance, issued by the Meteorological Office in London every day from June 1st to September 20th, at 2 30 P.M., on the basis of observations taken at the meteorological stations at 1 P. M. They cover a period of 15 hours, taken at 1 P. M. They cover a period of 15 hours, taken at 1 P. M. They cover a period of 15 hours, the conditions are sufficiently definite a "further outlook" extending the period covered by the forecast to two or more days is added. The office issues a special notice farmers whenever a spell of several consecutive days of fair weather appears probable. The service is free, except that recipients pay the coot of the telegrams. The Board of Agriculture and Fatheries has just nested a notice calling the attention of farmers to the harvest

Reselle.—The news that a canning factory in the Philippines has begun to manufacture resells sauce is of interest as marking the initial commercial stage of an industry possessing great possibilities. Resells (Phiscus seddarfia Linn.) was introduced a few years ago into the far southern United States from the West Indies, and has just begun to be cultivated in the Philippines. Until recently the only edible part of the plant was supposed to be the fleshly ealyses, from wheth can be made a sauce exactly resembling craniterry saure an appearance and flavor, as well as surp. jelly, and wine. Lately it has been found that the issues and young stems of the plant also yield palatable products, and the exploitation of reselle has been furthered by publications of the United States Department of Agriculture and the Philippine Bureau of Agriculture.

The Schröder-Stranz Expedition.—The tracio collapse of this expedition in Spitzbergen has already been reported in these columns. Capt. Starral, who rescued the survivors from their ship at Treurenburg Bay, carried them overland to Adven Bay, from which point part proceeded to Norwey and past to Germany. A legal investigation has been undertaken at Christiania concerning the reported dissensions between the Norwegian crew of the expedition's ship and the German scientific staff, which may have had something to do with the deplocation outcomes of the enterprise. Early in June Capt. Starrud set out again from Advent Bay scross Hinlopen Strait and exploring the northern coast of North East Land for traces of Schröder-Strans himself and his lost companions. There is, however, hardly any hope that they have survived.

hardly any hope that they have survived.

Frams Josef Land is one of the three regeons that are focusing the attention of the world in connection with the present active campaign of Arutic exploration, the others being Spitzbergen and the problematical Crocker-land. At the end of August, 1912, a Russian expedition under Capt. Sedow sailed for Franz Josef Land, with the hope of ultimately pushing on to the pole. The enterpties appears to have been poorly equipped and bedly organized, and the start was made dangerously late in the season, especially as the winter set in earlier than usual last year in the Arvito seas north of Europe. After being damaged in a storm, the ship made a stop in Nova Zemblas, and sgain proceeded north Reptember 19th. Early in November rumors reached Europe that the party had been shipprecked. It as total fate is still uncertain, and the question of sending out a rolled expedition is now being agitated in Russia. An alternative suggestion is that the Russian government shall ald in pushing forward the expedition for Franz Josef Land which M. Jules de Payer has been organizing for some time in France, and which was planning to sail before the end of the present summer in the Norwegian season. "Loydran."

#### Aeronautics

An Omnibus Aeropiane. Guseppe Colucet of Boston, Mass., has patented a flying machine which has a plurality of pairs of supporting wings extended from its body and being alternatedy monoplanes and huplanes together with which its uses a proteally mounted substantially horizontal elevating plane. The patent is No. 1,083,108

The Bantson Aviation Station.—The aviation station of Bantzen is soon to be completed, and it will take as good rank from the fact that it lies between Berlin and Vienna, it being proposed to establish an aerial connection between these two capitals before long Upon the inauguration of the new establishment there will be a number of events such as altitude tests and bomb throwing, destruction of railroads and other works.

As Aeropate Propeller with Valve Openings.—
Herbert Prince of New York city, in patent No. 1,008.—
271, shows a propeller for acroplanes which has a number of blades rotating about a common axis and are passages with proted vanes for controlling the passages.

Rack gearing is provided for opening and closing the vanes, and a cam mechanism operates upon the gearing to open the vanes of one blade while it closes the vanes of another blade. Means are also provided for varying the action of the cam goaring.

Moreau's Sacrifices.—Moreau, the French inventor, who rewently won the Bonnet prize for flying with his hands off the controls of his machine, has an interesting history. He is employed by a large printing house in Paris. Most of the money that he earns is devoted to avastion. His family and himself must content themselves with the hare means of subsistence. Despite his modest insome he has done wonders in designing his automatically stable machine. It is to be hoped that the winning of the Bonnet prize funds by Moreau will induce either the French government or wealthy French patrons of avastion to take an interest in him.

A New Schittic-Lanz Alrahlp.—The second Schittic-Lanz airchip of the Gorman army, known as "St. II," and designed by Prof Lanz, is now incaring completion at Mamheim The new airship contains 847,000 cube foct of gas. It has five care, one for the commander in front and four for the crew. Two of these four care are loosedy suspended in the center line fore and att, and the two others are fixed rigidly in the middle on each side of the center line. Four motors, three May-bach and one Daimler, drive the airship. Two propellers are connected with each motor. The speed of the vessel is estimated at 45 miles an hour.

The Elffel Tower Weather Reports.—Military semmatic are now recoving weather reports from the Elffel Tower wireless post, and this spenal service was started running a short time ago. Each day there are sent out two weather bulletins, at 10 A. M. and 5 P. M., and these are received by all the military wireless stations, being spenally drawn up for the needs of army seromatis. The chief officers at each station will be thus able to draw up weather charts and to interpret these according to local conditions. It was upon favorable notice from the Tower that Dubonnet and Rumpelmayer made revent balloon trips, and the ariship "Adjustant Unesnot!" started on a long voyage from Paris. Guillaux made his acroplane trip to Ham-

burg and Lotort left for Beris reopens only or age and with a burg and Lotort left for Beris representations. The British Airship "Eta."—The "Eta," the least the royal arcraft factory, is now undergoing tests. The shape is a modified Parsawal in type. The eapmenty is 100,000 cubic feet. There are two radial statuonary 160 horse-power engines set on opposite axides of the ear with their axee placed transversely. As in the Parsawal airship servicing propellers are used. During one of her trial flights, the "Eta" went to the assistance of naval airship in C. which had broken down The novel experiment of towing the dushibed airship in two depths are used. In a reccont number of Flight's a photograph was published which shows the dushibed airship in two of the "Eta." A difference in level of about 600 feet was maintained in order to avoid all chances of fouling the ruddler gear.

Perventing the Dreaded Back-Fire.—One of the most formulable and greatly dreaded causes of accedents in flying machines as back-fire in the carburetor. As a case the result of an attempt to solve this seconds problem an ingenious device has been invented by J. Holt Thomas an ingenious device has been invented by J. Holt Thomas in figure to the present does not present does not present to prevent back-fire, but is intended to prevent damage by putting out the parts of the machine. A two-way cook on the carbureter is connected with a lever normally held down by a fasible plug which made at a temperature of 140 deg. Fahr. A plug fusible at any desired temperature may also be used. When a back-fire occurs the plug is melted and this allows a small steel spring to set upon the lever, closing the tuel line to the supply tank. It also opens, simultaneously, a vent which allows the fruel remaining in the earbureter to be drained to a point below the feedings or to any point outside the danger or any point outside the danger on the set.

## The Jungfrau Railway

#### A Great Engineering Feat

On February 21st, 1912, the tunmal beneath the "Monk" was completed to the Jungfran Pass, and early in August the Jungfran Pass station, the highest rallway station in existence, was opened to traffic

In 1893, when the Sales millions king, Adolf Gaute Zeller, proposed to construct a unitival to the Jungfan hydroling beneath the Eiger and the "Monk," the scheme was deemed visionary and impracticable Work was commenced in 1893, and in 1896 the first section was completed and put into operation. This section of 2 kilometers (1.2 miles), mostly above ground, connects the Eiger glacier station (elevation, 2,223 meters, 7,321 feet) with the Swigs railway station at Kieline Schedligg (2,004 meters; 0,472 feet). At the Eiger glacier begins

the great (name), with a meen gradient of 23 per cent, complied to its temporary termines at the Jonatran Pless At a distance of 44 kilometers (27 miles) from Kleine Scheiding and an elevation of 2,908 meters (18,408 feet) the tunnel grazes the northern wall of the Eiger, and here the rock-heen station Eigerwand, which overhooks Grindelwald at the mountainty foot, was opened to traffic in 1963. From this point the tunnel follows a curved line to kilometer 57 and there expands to form the station Eigeneer (elevation, 3,101 meters; 10,308 feet), which commands a wide thew of the glacter and has been visited by thousands of couriests since it was opened in 1905. This station was the provisional terminus of the fine until last August

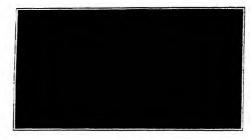
Work on the tunnel section of 3.5 kilometers (2.2 miles) between Elemeer and the Jungfrau Pass was commenced in 1997, by the executation of a large machine room and a interal gallery opening on the mountain side, for the removal of evenwated material. For 3 kilometers (19 miles) from this point the tunnel runs in a straight time under the "Monk," with a gradient of only 6.3 her cent, so that tooth radia are not needed. In 1911 the work of ventilation and removal of material was facilitated by opening a lateral tunnel 200 feet long to the vide of the "Monk." Here the tunnel resources the gradient of 25

tunnel resumes the gradient of 25 per cent, which is maintained up to the Jungfran Pass (elevation, 3,457

meters, 11,341 fort1
Although the work was carried
on day and night, the great elevation and the hardness of the rock
limited the daily progress to abant
12 feet. In some sections the grebsresisted the hardness the solidity
made all lining of the tunnel superthous. The thun ridge which forms
the Jangfran Pass was approached
with the utmost caution as it was
foured that the glacler night he so
deep than the tunnel night near
from rock into lee. This four was
aliaced by tenture benefits, but
the glacler was near enough to
freeze the dynamite and lower the
tomperature of the workings to 20
one. Edit.

It had been calculated that the tunnel would be opened to the air at the Jangfun Pass on February 21st, and the opening was actually made on that day. A week prest

outly the workers had abandoned the head of the main tunned, which is here expanded to even use a lateral main proceeded to even use a lateral gallery about 80 feet long which debouches on the glaciety part when the property of the main tunner of the property of the property of the main tunner of the property of the main tunner of the property of t



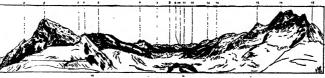
Arrival of the first train at the new station Jungfrau Pass. On the right, near the station house, the exit to the glacier.



The exit to the glacier.



View showing an entrance to one of the stations in the new Jungfrau Bailway



Panorama visible from the Jungfrau Pass.

1 Elger, 13.040 feet. 2 Monk, 18-468 feet. 3 Upper Monk Pass, 10.394 feet. 4. Sphinx, 13,779 feet. 5. Trugberg, 13,806 feet for the pass of the feet of the pass of the pas

with the station proper, which i terrace in a spot reason sheltered from avaia-The building, which will be on pleted next year, will comprise new eral stories and will include, in addition to a walting room and a restaurant, apartments for the per-sonnel and also for tourists whe wish to indulge in mountain climb ing or to enjoy the winter sports for which excellent facilities will be A covered viaduct about 300 feet long, with a gentle upward grade, will lead from the building to a natural rock terrace bounded on three sides by almost vertical precipices, while the fourth side furnishes a direct and level pas to the wide plateau of the pass, where in the hottest day in an

visitors can wander over ics, snow and glacters and enjoy skating and ski running, without danger or heroic exertion. A sledge roof over the Aletch glacter has been suggested, and even Guyer-Eeler's jocaliar proposal to maintain a regular summer service of dog sledges between the station and the distant Konkordia club house may be carried out.

The extension of the tunnel and railroad to the sum-

The extension of the tunnel and relitond to the sumnit of the Jungfray, about 2 mine leyrond the page, will not be undertaken immediately, as if has been dound most profitable to proscute the work by successive stages. The original plan contemplated the completion of the whole line in seven years, with an outlay of about 8 million frames (\$4,544,000), but more than 10 million frames (\$4,544,000), but more than 10 million frames (\$4,544,000), but more than 10 million frames than 1,000 frames per meter. The financial burdens have been materially lightened by the earnings of the completed sections. Furthermore, the concession for the section between the pass and the summit of the Jungfrau has expired, and the Swites advocates of "conservation" oppose its renewal—unwisely, because the railroad will not injure the Jungfrau, but will merely make it accessible.

The ascent to the Jungfrau Psss on foot is seldom made, as it is one of the most dangerous of Alpine tours. The view from the pass is wonderfully beautiful and impressive. To the north it extends far beyond the

ours. The view from the plant is wonderruity obsurbers.

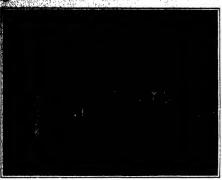
To the north it extends far beyond the gladest, which here makes it a tumulituou descent to the valley. It includes the wide northeastern plain of Svitaeriand to the distant bills of the Schwartsward and, in the foreground, Interlaken, Lake Thun, and the Lautsbramann valley, in the seat the view is cut of by the upper pass and the sharp-angeled pyramid of the "Monia," which rises almost vertically to an elevation of 4,105 meters (1,304 feet), while in the distance appears to the peak of the high of the plant of the peak of the high of the peak of the plant of the peak of the peak of the peak of the plant of the peak of t

The view to the south is thoroughly Arctic. The Aletsch, greatest of Alpine gladers, stretches down toward the Rhone valley, figured by the snow-clad slopes of

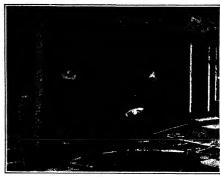
the "Monk" and the Jungfrau. The eye fluds no green spet, no sign of life, and no human trace, except the Konkordia hut in the far dis-

This striking contrast between the smiling landscape in the north and the bleak desolution of

(Conduited on







Building their own home.

## The Daniel Boone Idea in Education

A School System Based on Voluntary Muscular Work

On the outskirs of La Porte, a small manufacturing town in northern Indiana, a group of thirty-five teachers and one hundred and forty hoys are making an experiment in education. They live in a perfect or equipped school, located in the heart of an Nöostre farm. These beachers are all "cultured" in the conventional sense of the term; for they are the graduates of isading American or European cities. Nearly all they are the graduates of seding American or Well-to-do partonis and have known all possible comforts from their early days. Neither marries nor pupils, however, bear any external signs are any order of the service of the

ance still suggestive, so far as possible, of the forests from which they have spring.

Like many other modern improvements, the Interlaken School is a proriest against accepted ideas in American education. That there is something fundamentally wrong in the present methods of bringing up children is now a settled conviction among tilinking people. Ferhaps that is due for the fact that life is now a very different thing from what it was fifty or a hundred years ago. Instead of walking we ride in automobiles or trolley cars; instead of cultivating our own food, we have it left at our doors in packages or cans; instead of weaving and making our cothons, as most American families did a inunored years ago, we buy them at stores. All these things mean progress; but every step forward in invention is also part of the general 'conspiring the them."

Seventy-by wers ago eighty per cent of our Americans lived upon the fings. The by rose early in the mortules and did the "chores," In spring he plowed; in summer he performed his task in open air work on the farin; in the settman he heiged to harvest the crops. In all cases he did read work—purposeth work that added to the world's wealth. Now the great majority of bors live in the town. Peop hope and rich boys spend but a faw hours at school, more or less willingty; and what his order is over they are left to theif own devices. The fact cannot be secaped that the country buy is constantly using his hands, while the city boy is not. Sided city hope, send dispose with their height shoughter, and rill purfore, thair "members," daths "rortime distinct control that "rortime daths" country but distinct city hops, send dispose with their height shoughter, and rill purfore, thair "members," daths" rortime distince—accept that

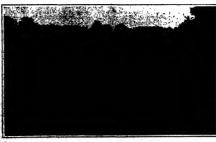
BOTH THE WAS ASSESSED.

for the purpose of esting and dressing. But the human hand, after all is said and done, so far paramount importance. It was not until man began to use his forward members for other purposes than locomotion that he really began to progress intellectually. As long as the infant has to lie prome, its mental progress is extremely limited; as soon as it begins to creep and walk, its infellectual life begins to dourish.

We sain practically all our knowledge by the use of our hands and the rest of our muscular waten as infants. There is not a single one of us with would have any first-hand knowledge of iron or any other metal unions we were able to take it into our hands Our cree fell us that it is gray in color, that it is crystalline, that it as urface is smooth All these thinse, however, might be equally true of painted wood I is only when we take the metal in our lands, attempt to bed and to break it, that we really understand its nature. Not only do our muscles enlighten us as to physical facts; they interpret the deepest cunctions of the sout. Pleasure, pain, agony, remores—all those feel-



Training in husbandry.



Summer on the lake.

ings find their appropriate spokesmen in facial expression.

It is a fact of the greatest significance for educators that the function of speech is localized in the third frontal left lobe of the brain, in close proximity to the motive center that regulates the hight hand Left landed persons have the center of speech in the right lobe. In other words, the faculty of speech is closely related to the faculty that courted is the mad. Both developed in the same parts of the brain. Teach a left-handed child to use its right hand and as due case of stammering sometimes results. The two highest attributes of must—speech and the hand—seem to be really a part of one and the same intellectual faculty. Any attempt to educate a child without completely training the hand is fundamentally wrong

Clearly, what we really need is something like the hand training that our boys used to get upon the farm —not the similarity of manual training such as most educational systems have introduced in recent years, in the old days the school could properly neglect this

able of education and leave it to the home but, as we have said, the indefashioned home has disappeared. These the modern educational system, therefore, finds some indequate substitute for the muscular training of other days, its graduates will be only half men or half women. Not only is the body stunted, but the mind for the mind liself really grows and develops as a result of nuscular and especially of manual training.

It is to supply this need that the new schools have been established in Europe. In the founding of the Interluken School the basis for an extension of this system to the United States was laid.

In the creation of the Interlaken School the logs have fived over the experiences of the early American pioneers. Ten years ago the site of the school was a primeval wilderness. Early in June, 1910, the Interluken boys, a hundred and twenty strong, invaded this neglected waste. arised with axes, corpeneer tools, and above all, youthful enthusiasm for work above all, yournit entities on recovers and new expertences. The school had its inspiration in the principle that boys should regain the unique intent which their grandfathers possessed of doing things for themselves. What more approbeginning could they make the that of erecting their own school buildings with their own hands? That spring the hoys spent making plans, calculating, estimating material, devising schemes of decoration, and outlining the work one was forced to participate; for the of theory is to make the work purely voluntary. The plan was to establish a summer camp on the site of the future school. All who wished to take their vacation in this way were invited to come (Concluded on page 370)

#### The Encyclopedia Americana Enjoined from using the Name "Scientific American"

S OME years ago the representative of a publishing house in New York called at the office of the SCHEN-Onouse in New York called at the office of the Scientific Americas and ind before a representative of the company a plan for the publishing of an encyclopedia for the American people similar in scope and design to the Encyclopedia Britannica, only that it should be planned and carried out in such a way as to be of special value and interest to Americans. The project secured to possess merit, and a number of interviews followed, during which is held of the Scientific American followed, during which is not of the Scientific Americans. CAN Was sought in preparing material for the new work and finally one of the members of the company was insited to act, but entirely in his individual capacity, as editor in chief. A corporation was finally formed under the laws of the State of New York to carry out the work of publishing the Encyclopedia and placing it the work or judicialing the Encyclopedia and picking to input the market. This company was called the Ameri-cans Compan. A contract was finally entered into with the SCIENTIFIC AMERICAN by which the literary end of the work should be conducted in the name of the Scientific American Compiling Department, and in the contract which was entered into, which was for a period of one year, and which was made renewable year by year, the Encyclopedia was sold to subscribers together with a year's subscription to the Scientific American. nd in order to establish the connection the SCIENTIFIC AMERICAN conferred upon the corporation the right use the title "Scientific American Compiling Depart-ment."

All the husiness of publishing the work and of place ing it on sale was conducted by the Americana Com-pany. A notable list of contributors was obtained, and from a literary point of view the work was satisfac-tury. For a long time the arrangement worked satis-facturily, but in the course of events complaints were received at the office of the Science 12 Agracas in which it was charged that the representatives of the which it was charged that the representatives of the Encyclopedia had been quilty of misrepresentation, and it was found that various abuses had crept in, which Munn & Co seemed powerless to have corrected. Every effort was made to correct such mistakes and abuses, and, finally, the publishers of the Eucyclopedia were notified that unless such abuses could be stopped altogether, the arrangement would be terminated

About this time it was discovered by Munn & Co that the publishers of the Encyclopedia were making plans to publish a Biographical Encyclopedia as an addendam or appendix to the main work. People of prominence, some of whom were well known to afficers of this company, were invited to have their portraits published in this work, but they were at the same time luvited to subscribe a generous amount in order that their biography might be embellished with a steel engraving of themselves. It was discovered that in some cases the canvasser who solicited those contracts held himself out to be a representative of the Scientific American When this fact became known it was de clided that the arrangement could not be continued and the officers of the company were notified that owing to the various abuses which had arisen, the name of Scientific American Compiling Department must be withdrawn from the Encyclopedia and from all litera ture being sent out by the company. It was also dis-covered about this time that a new corporation had been formed which was known as the Americans Company of the State of Muine. This company had a capitalization of \$1,500,000, and amountements appeared in the papers and magazines stating that the stock of the company was being offered to the public. Minin & Co pro tested against the issue of this stock, and insisted that the use of the title Scientific American in conjunction with the Compiling Department must be discontinued. A number of interviews took place between the officers of the two companies, with the final result that the officers of the Encyclopedia Company refused to discontinue the use of the title Scientific American Complling Department in connection with their car and as a result the contract was terminated by the complainants at a meeting of the board of directors of Munn & Co. held in May 1911, and in June, 1911, a resolution was passed directing the officers to engage counsel to bring suit against the Americana Company to enjoin them from using the titlo Scientific American, either in connection with the words Compiling Department or in any other way, and they were further directed to notify the Americana Company of this fact in order to give them a final opportunity of withdraw tng without the necessity of a law suit.

No definite answer was received to their comm

cation, but a few weeks later it was learned by the officers of this company that a new stock corporation was being projected and carried out by the Americana people it appears that a corporation had been form by them, but without the knowledge of the officers of the Scientific American, under the title Scientific American Compiling Department, with a capital of \$2,000. In the autumn of 1911, after notice had been served of the impending injunction and after the contract had been terminated, the stock of this company was increased from \$2,000 to \$2,000,000, and by offering some stock as a bonus the stockholders of the An cana Company were induced to exchange their stock in the Americana Company for the stock of the Scientific erican Compiting Department

Papers in the suit were served upon the defendants i December, 1911, and the suit was tried in July, 1912, before Vice Chancellor Emery of the Court of Ch of New Jersey. Notices warning the public of the suit were published in the SCIENTIFIC AMERICAN in 1911 and 1912 at regular intervals.

1012 at regular intervals.

The option of the court has just been handed down, and it is sweeping in its character. It is very long and covers every phase of the case from the very beginning. It consists of over fifty pages of legal cap, or some 15,000 words. The history of the case from the beginning is creedily sone over and much apecs is given to unraveling the complicated relationship of the various companies under which the Encyclopedia was operated, which conducted of at least four different corporates. tions with overlapping interests and responsibilities. The opinion of Vice Chancellor Emery states:

The opinion of Vice Chancelor Emery states:

"The main object of the bill is to epidot the use in any manuer of the name "Scientific American" by any of the defendants in connection with the corporate title or with any of their publications. The complainants in their state in the grounds:

"First. That the right to use the complainants of their publications are selected as a state of the stat

"The bearing of the matter of the extent of proof of confusion, loss or injury, or actual damage, on the main question now at issue, the further continuance of the name. "Scientific American" in connection with the name of the property of the same of the name of the nam

to the present connection of complainants with the work and responsibility of some kind therefor.

"Lending the running of the contract and parity by reason of the Impression of complainants connection with the work given by agents soliciting subscriptions, confusion occurred which required attention by complainants to chains involving financial responsibility securities them, as well as responsibility from a literary or editorial standpoint. These claims, based both on financial and literary responsibility, were as frequent—every two weeks on an average—and of such a character as to impose upon complainants the burden of responsibility of the contract of the co

"This contraion requiring attention and action on the part of the compinimants to avoid responsibility, has ulready, in my indement, ensued an injury and damage to the compinimants in carrying on their business as publishers of the Neutrantz Augusta, Surgespaper, and application of the Neutrantz Augusta Surgespaper, and in the present and future publications of the "Americana" they are entitled to equivable relief as the only effective relief. The confusion results primarily and directly from the use of the compisionars well known and long established manne Sometripto Augusta Surgespaper, and the property of the compision of the surgespaper of the compision of the Schutzpier American has made a specialty for sixty years.

"The public to whom the work is offered for subscription, are entitled to know that with the publication and placing on the market of the present editions of the "Americana" the publishers of the Schuzzure Americana have no connection or responsibility of any kind, financial or literary. To compel, or attempt to compel, sortie explanation by soliciting agents, that the publishers of the Schuzzure Arranco are not connected with a continuous continu

method of insuring to come is that of enjoining altoge-name "Scientific American" is that of enjoining attogether the fightles aname "Scientific American" is the corporate also enjoining its use in the publication or of the "Americana" of the editions of 1813, future editions except as hereafter stated."

The use of the title Scientific Americ partment was not only desirable, but the most conveni-ent method of bringing before the public the literary etion of the SCIENTIFIC AMERICAN with the compiling of the Encyclopedia, but when the publishers of the former discovered that this name was being sxted in a manner not covered by the contract not intended at any time of the negotiations, and that they had no control or power to correct these abuses; when it was discovered that the name of the Schmither when it was discovered that the name of the SCHRYING ARMICAN was being used to promote the sale of a blographical work of which they had no knowledge or interest; and when, lastly, it was found that the stock of the Encyclopedia was being placed upon the market under the name of the Scientific American Compiling Department, the publishers of this periodical having no interest in or control over these transactions, the only course left was to bring suit to enjoin the use of the name "Scientific American" in any and every con-

nection with the sale of the Encyclopedia.

The decree of the Court was entered on October 28th,

#### Between Life and Death

NABIOSIS, a state where all vital functions of the A NABIOSIS, a state where all vital functions of the A organism are suspended, without however death occurring, has been known for about 200 years, in the case of some of the lower animals, which can be dried and restored to life, even after a considerable time,

merely by the action of moisture.

A Russian scientist, Prof. Bachmetief, has tried to A Aussian scientist, Froz. Hackments, has freed to ascertain whether phenomena such as these could not as well be observed in the case of higher organisms. While examining insects at decreasing temperatures, he found that the temperature of their body, after reaching the freezing point of water, would gradually fall as low as 5 deg. Cent. (in the case of some species even 7 deg. Cent.), in order afterward to rise one de-

gree and esentually to continue falling regularly and gradually. Death would only occur at 10 degrees. Prof. Bachmetlef first thought death to be due to the freezing of humors, but be soon found that the humors of insect bodies already frees at 5 deg. Cent., any vital function becoming impossible at this temperature. At temperatures intermediary between this porature. At temperatures intermentary between this point and the lethal temperature, a strange condition of anabiosis is produced, the organism being as it were between life and death. Animals in anabiosis have been repeatedly restored to life, even after a considerable time, by a gradual rise in temperature. This conable time, by a gradual rise in temperature. This condition could be fitly compared with that of a clock with stopped pendulum, the mechanism of which could be at any moment, started again by a slight impulse given to the pendulum.

to the pendulum.
These experiments were then extended to the case
of some small-sized mammals (bats and white mice),
which by the application of artificial respiration, could
be reduced to some sort of lethargy, their body standing temperatures too low otherwise to be endured (0
deg. Cent., and less). Further experiments are to be made on higher animals.

made on higher animals.

The main purpose of the experimenter was to find a safe cure for tuberculosia. Applications of a mainly practicat character, calculated to revolutionise some of our habits, are however likewise to be made. As regards the case of tuberculosia, it is well known that the microbes producing the maindy will die or lose that powers of reproduction, on being submitted for two or three weeks to a temperature of 5 deg. Cent. If say, 8 deg. Cent., all Koch microbes would be arfely killed or else rendered innocuous. On the other hand, killed or else readered innocuous. On the other hand, Bachmetfel is of the opinion that it would be advan-tageous to reduce to Enablosts, without any need of receding them, such domestic animals as are unproduc-tive in winter (bees, sheep, etc.), as well as those which are to be transported to considerable distances (cattle, fowls, fish, venison, etc.) in order to restore them to life whenever required. In order to begin with something practical, Bachmetlef has applied his od with excellent results to the long-distance teams

A New Scotista Antarettic Expedition is being organ-ised. Its plans include the establishment of a base in Coate Land. A part of the expedition will winter here, and utilimately endes vor to cross the Antaretic southeast to Ross Soa. Meanwhile, the rest of the expedition, after returning to Australia for the winter, will, if possible, effoct is landing at Vindifurdo Sound in order to meet and sid the party evosing from the opposite side of the contineant. Extensive coaseographic re-exambnes are to be carried out in the South At-lantic.

# The Fire Control Platform of a United States Battleship

How the Telescope Sight, the Range Finder and the Spotter Co-operate to Secure Good Shooting

By J. Bernard Walker

If we were asked to name the one particular mechanism to which more than any other is due the marvelously accurate shooting of heavy guns at the present time, we should unhestiatingly pronounce in favor of the betscope sight. Remove the telescope sights from the batteries of a modern warship, and the ranges would have to be decreased from twelve thousend to three or four thousand yards, and the shooting would be very indifferent at that. The modern system of fre-countrol is very elaborate, highly scientific, and dependent for its remarkable results upon the co-operation of many delicate instruments and the combined observations of several highly trained specialists. Remove from the system any one of these instruments or any one of the sen concerned in its successful operation and the result would be impaired somewhat; but remove the telescope sights and you remove the whole thing.

Twenty-two years ago there was not such a thing as a tenecope sight stateshed to a naval gmin in the whole world. Ships' guas were using the old open sights, the one at the breach being adjustable to give the proper elevation to the gun. While activing to keep his eye in such a posttion as to maintain the two sights in line, the gunner awaited the critical moment when the roll of the ship brought this "line of sights" onto the target; and then he fixed the gun.

About this time, or to be more exact, in the spring 0, a young officer of our Navy, L Admiral) Bradley A. Fiske was aboard the U. S. S. "Baltimore," watching a test of his new electrical rangefinder. During a delay in the firing, due to a flock of schooners having got in the way, he amused himself by looking at the schooners through the forward teleof the range finder instrument, and noticed how definitely the cross hairs of the telescope moved across their sails with the gentle rolling and pitching of the "Baltimore." The thought suddenly struck him that anybody could fire all the guns in the broadside at that place where the telescope stood, and hit the target every time, by setting the telescope at the angle of depression equal to the proper angle of elevation of the guns, leaving the guns parallel with the deck and firing when the roll of the ship brought the cross hairs on the target This line of thought ultimately led Lieut. Fiske to de sign a telescope which could be mounted on some part of the gun carriage that did not recoil, though it turned with the gun, the telescope being capable of depressi with regard to the gun through a number of degre corresponding to the degrees of elevation for a given

The idea was posh-poched, but the invention was patented nevertheless. A suitable telescope was then bulk and applied to a gun on the gunbost "Yorktowu," to which Lieut. Fisic hab been assigned; and on September 12th, 1892, during practice carried out at Unalaska, Alaska, in competition with guns fired with the open sights, the new telescope sight proved its great superiority, to the astonishment of all on board, except the inventor himself.

The advantages of the tolescope sight are many: It is shown exactly, instead of inexactly, what the gus is pointing at: it swooderfully clears up the target; it is enlarges the field of view over the old system some four or five times; it does not recoil with the target, and therefore the gus pointer may keep his eye constantly that the eye-piece; and, lastly, used in combination with the powerful and rapid gus elevating mechanism now employed, it enables the gus pointer may be sharped to keep the cross section of the section

employee, it enables the gain pointer to keep the cross share of the telescope, constantly upon the target ship. We mentioned above how it occurred to Lieut. Fisher that a telescope, set at the proper depression for the range, might be used at some definite position in the ship, and that from this startion the whole battery might be laid in parallel and fired sizualizanceshy by electricity, when the roil of the ship brought the telescope sight on the target. In 1890, Lieut. Flake secured a patent on a method embodying this lidea, and this method is what is known in modern days as "director fring." Some experiments were made in the British navy about the time that Flake secured his patent. The idea remained dormanty for many years, but it has labely been taken up, and throught to undoubted execution of the start o

. Due over Navy has developed its own system of direction distriction distriction of the details of which are of course Dopartheest exercis. Such a system has been installed and recently tested on a vessel under the supervision of Lieut. Com. B. A. Long.

Director uring is certain to occume general among the navies of the world; and it is gratifying to know that our Navy, to which modern naval gunnery is indebted for the telescope sight, has secured excellent results in its first test of the latest improvement

using in the tensors sight, has enemed exceeding a suits in its first best of the latest improvement. These existing confidence, such gen is elevated by its own gen-pointer, who, with his over at the telescope and his band on the second such as the second such as the his second of the second such as the second such as the high second such as the second such as the second such as the naily are second; would see the second such as the second as above by the fact that the 12-gun battleship "Artnasa" recently returned to her home port. New York, with the following target practice record for one of trurets: During one of the runs, the two 12-inch guns of No. 4 turres exceed six hits in 57 seconds, the time being taken from the start of the powder and shell from the ammunition room below to the firing of the less about the six.

This fine work was done during target practice held for the purpose of selecting run pointers, that is, the men who elevate and fire the guns. The 12-inch gun is designed for a muszle velocity with

The 12-linch gus is designed for a massic velocity with full service charges of 2,800 feet per second; but for this practice she was using reduced charges giving a lower mussic redocity. The range was short; but because of the low velocity a furity high sight her range was necessary. Furthermore, the target was very small, being only one serventh of the area of the target used in lettle practice at 10,000 yards, and it represented only about one fitting to the total projected area of a bat-

The 12-linch gan is such a remarkably accurate piece that, if the distance to the target is known, and the sight setter and pointer are expert, the shell will find its way unerringly to the built's eye. It will be understood, of course, that the three conditions named are not the only conditions affecting accuracy; since there must be taken into account the condition of the powder, the temperature of the gun, the wind, the density of the atmosphere, and other conditions which have their effect upon the flight of the projectile. But, broadly peaking, it may be said that if the distance, the sight setting and the pointing are accurate, a built's eye will

Deficient, then, the fundamental necessity is to know the range or distance, and this is secured by the cooperation of two agesides—the range finder and the spotter. Now severy school boy knows that the distance to an inaccessible object may be determined if we know the length of the base line and the two angies at the end of this line between the bese and the distant object. Thus the surveyor measures a bess line with his stoci laps, seds up his transit at the ends of this line, measures the angies, and then, by a quick calculation, is able to determine the distance from the base to the object. Now the range finder is a most inputious instrument in which the bease line is measured, the angies observed, and the mathematical problem worked out, all surematically by the instrument tief, the resulting distance

to the object being indicated by a pointer on a scale.

The range finder shown on our front page engraving contains two object glasses, one at each end, directed toward the distant ship, and on the opposite side of the tube, at its center are the eyepieces for the ob The image of the ship that is received through the right hand object glass, is seen by the observer in the upper half of the field of the eyeplece. The image coming through the left hand of the glass is seen on the lowe half, and the images represe t. respectively, the upp and the lower half of the ship. The right hand of the observer holds a little thumberrew, which serves to move transversely along the axis of the tube a prism sects the rays of light that have be flected by the prism at the end of the tube, and are mass ing to the central eye-place. When the range finder is "out of focus" so to speak, the two halves of the ship out or rocus so to speak, the two harves or the smill will not be properly slighted, and the observer bring-them into focus by turning the thumbacrew. When signment has been secured, the observer looks at a small horizontal scale on which the exact distance of the ship is indicated by the triangular pointer shown

The range, as thus determined, is telephoned to the firs control station below deck, where certain currections are made, the corrected range being then tele-

phoned to the sight setter at the gun.

Even though the sight setter sets his sight har correctly, as: the pointer first when the horizontal wire of his telescope is exactly upon the center of the target it may yet happen, that because of, let us say, refraction due to the condition of the atmosphere, the full and

spinsh of the shot may be a couple of bundred yards over or short of the target, necessitating a further correction. This correction is made by the spotter—the officer shown in our front page curraving with glasses in his hand, and telephone champed over his cars Through his glasses he estimates that the spinsh is, each short of the target; and immediately he calls into his telephone monthplece, "200 mj" meaning that the sight bars must be raised to an extent corresponding to 200 yards in rungs. From this time on, during the firing, the judging or correction of the range is in the hands of the spotter.

## Electrolytic Production of Oxygen

C ERTAIN industrial applications of oxygen, such as autogenous welding by the blowpipe, require the use of a very pure gas, owing to the fact that impurities cause a lowering of the flame. The production of oxygen by distilling liquid air does not allow of entirely eliminating the nitrogen, and the best rectifying apparatus give a product which still contains from 1 to 14 per cent of nitrogen. The electroivile process appears to be better for this purpose, and it allows of more easily obtaining oxygen at 99 per cent or even more. The improved apparatus now produce crude gases such as oxygen at 96 to 98 per cent and hydrogen at 98 or 99 per ceni, and the gases are then fled. In the Schuckert electrolyzer which is des for this use, the gases coming from the electrolysis are collected in bell-shaped vessels. The elements of the apparatus are constructed so as to support variations current within the limits of 2.5 to 4 volts without producing any detrimental effect on the purity of the gas It is found that the oxygen which is produced in this way does not contain more than 2 to 4 per cent hydrogen for the crude gas, and the hydrogen contains less than 1 to 15 per cent oxygen. The mixtures of the two gases occur to a slight degree owing to the movements of the bath and the diffusion of the gases, and the amount of impurities increases as the electrodes come nearer logether. But as it is required to keep the electrodes rather close together in order to reach the maximum yield of gas, some degree of mix-ture of the gases must be allowed. A remedy was sought by patting in porous partitions in cement or asbestos, but these required much attention and raised the upkeep cost.

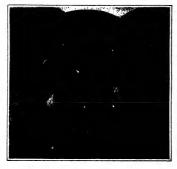
The iron anodes are protected by a deposit of mag-netic iron oxide which prevents their being attacked by the oxygen. In the bath, the presence of impuritie such as chlorides, sulphates, and the like is to be avoided, as they would give rise to ferric hydrate partly in suspension in the liquid and in part deposited on the cathode, which would require an increase in voltage. Caustic soda is used in practice for the bath, this not containing more than 0.1 per cent of nati, this not containing more than of per cent of sulphates, nitrates or chlorides. The gases produced by the apparatus are sent at first through a vessel containing coke which is sprinkled with water, and here the particles of caustic sola which are drawn over are absorbed. To eliminate gaseous impurities. istion is set up with a part of the oxygen and the 2 to 4 per cent of hydrogen which it contains, and the hydrogen in inrn is purified in the same way ing out the oxygen This action is produced by passing the gas through a silver tube which is heated to low ess by an electric current passing in a platinum spiral. The tube contains pumice stone treated with palladium. This method has the advantage of preventing explosive mixtures which might be formed, for instance, should the poles be accidentally inverted, and such mixtures cannot reach the gas holders. heating is done by the current from the main apparatus, the heater starts up as soon as the gas flows.

Practically all the expense in the electrolytic process in the code of electric current, as the apparatus is automatic and needs but liftle attention. All that is needed in to add a certain amount of water one day, this being 2 cubic feet of water per foot of oxygen or per 2 feet of hydrogen. Circumstances devide which is to be preferred, the air distillation or the electrolytic method. The air process needs a less amount of power, but requires constant watehing and experienced labor, it being in fact more expensive than the other when it comes to small plants. Besides, the starting up of the siparatus requires two or three hours, in which time it is not productive and consumes power, so that such plants should be run continuously as much as possible. On the contrary, the electrolytic apparatus can be started and stopped at any time without draw.

# The Completion of the Los Angeles Aqueduct

Bringing 265,000,000 Gallons of Water Per Day 234 Miles From the Sierras to Los Angeles

By Henry Z. Osborne, Late President Los Angeles Chamber of Commerce







Section of an eleven-foot steel siphon.

A drive through the aqueduct.

Smooth-finishing a conduit.

O WINN River Valley geographically is more of a Novala valley than one of California. The river from which it takes its name, in its southern course parallels the main range of the Sierra Newday, and has its source in and derives its waters from these grand mountains. The suowfull is extremely heavy in the high eastern side of the Sierras, and nearly wery canyon that leads steeply down to the plains of Newdad and the adjoining Tayo and Mono counties, in California, carries fine streams of water throughout the year, which streams are veritable rivers in the spring and summer months when the winter snow are melting. Thirty-five such streams empty into the Owens Iliver from a fariange area of 2,500 square miles. The length of the river is about 150 miles. Its waters are made up integether of the snow waters from the Sierras. The valley itself is from two or three to ten miles wide, and unificient vater flows in the river to irrigate all this valley, with an overflow into Owens Lake, area of Square miles, where it performs no useful service, of sufficient volume to supply a city of two millions of people with an ample quantity for domestic

It was to this grand source provided by bounteous nature that Los Angeles turned, when it was foreseen that in the course of its rapid growth there might be a shortage in the indiscensable water sundy.

A former city engineer and subsequent mayor of Los Angeles, Fred Eaton had spent some years of his ceriber life in the Gwens River Valley of injo Countr, and to his aftert mind probably first occurred the idea of Owens River as a source of the permanent water supply of Los Angeles He presented the subject to the Board of Water Commissioners and to Chief Engineer William Muhollanda, and the latter was sent with



Building a reinforced concrete siphon.

Mr. Eaton to look over the ground. Upon his return a favorable report upon the project was made by Mr. Mulholland, who in 1905 prepared plans and estimates for an aqueduct to bring 260,000,000 gailone daily to the eity, the cost of the work to be \$23,000,000. The plans were approved by a board consisting of John R. Freeman, James D. Schuyler and Frederick F. Shearns, and the citizens by a popular majority of 10 to 1 voted in favor of construction, and work was begun in favor of construction, and work was begun.

and the citizens by a popular majority of 10 to 1 voted in favor of construction, and work was begun.

Two years were exhausted in finding the best and most feasible route, which was often changed by Mr. Minholland and his chief assistant, Mr. Lippincott, for economic or other good reasons. Fourteen months were required for the enormous preparatory work. So that, with the exception of some work at the Distabeth tunnel and at the intake, the actual construction work of the aqueduct commenced in October, 1008. The wisdom of thorough preparation even at the cost of considerable time was fully vindicated by the rapidity and certainty with which it proceeded from that time.

The Aqueduct.

The intake of the Lee Angeles aqueduct, which is constructed of concrets in the most solid and substantial manner, is situated thirty-live miles above the mouth of the Owens River; this to insure against the possibility of sikal solutions. Its elevation above see level is 8.912 feet. The dimensions of the aqueduct vary greatly on different parts of the work, depending upon the physical nature of the country through which the water is passing. The first 22 miles is a canal, 62 feet wide at the water surface, 88 feet wide at the bottom and 10 feet deep, uncommanded, and at a slightly higher elevation than the river. This canal was excavated by three electric fireders.

At the Alabama foot-hills the aqueduct is conducted



Eastern slowe of the Sierras, the watershed of the Owens River.

Spag the anoministical, pisseing Owens Lake on its sweigen side and about 200 feet above the surface. This part of the aqueduct is converse lined, 30 feet wide, 12 feet deep and 35 miles long to the Hairwe reservoir, the fixed of the five great storing beatins. This upper portion of the aqueduct to Hairwe reservoir, is the only portion uncovered. All the remaining conduct is conversed. ered with reinforced concrete slabs air inches in thick-ness. The conduit is lined with concrete from eight to twelve tuches in thickness. South of Hatwee v

the size and

shape of the aqueduct vary considerably, and they were determined by the topography of the country and the char-acter of the soil. The average size is twelve feet wide and ten feet deep.

The Tunnels. The enermous amount of tunnel work, the great length of the tupnels and the rapidity with which they were drive n. constitute one of the mo notable features of the aqueduct. All told, there are tunnels on the line, varyfrom 100 feet to the great Elizabeth tun nel, 20,870 feet, or over five miles, long. All world records for tunnel construction were broken in this tunnel. The Board of Con-sulting Engineers was that one year's time would be required for preparation. four years for actual con-\$1,013,000 to cover the cost. Work was commenced simultaneously at both ends of the tunnel, October 5th, 1907. and 250 men were employed night and day in boring the mountain. An average rate of 11 inches per hour was made throughout, was completed 1911, to a

years and 7.8 months and at

From tunnel to sisten.

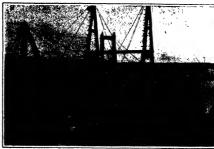
months and at a cost of \$500,000 less than the optimate, it is the exceed longest water turned in the United States. This total length of tannels on the signature is \$10,000 miles, at which 42,000 miles at on the meth squeduct, and \$400 miles on the power system.

The Shaevrett Systems.

leading to this reservoir is 500,000,000 gallons per day -about twice the capacity of the aquednot below that point. It is made so large for the purpose of carrying the excess flow during the melting season and accumulating a large reserve. The reservoir, which occupies a former channel of the Owens River, is now a large a notant challent of the Owens haver, is now a large lake seven miles long, with an area of 15 square miles, and a storage capacity so large that in case of emerg-ency it would amply supply the city of Los Angeles for three years. The Fairmout reservoir is 127 miles south

feet above the city. They will impound the water just below the outlet of the aqueduct, and regulate the distribution. These two reservoirs mark the end of the Los Angeles aqueduct proper At the recent bond elec-tion, held April 15th, 1913, the city voted \$1.500,000 additional bonds, to construct a trunk line from these reservoirs, 28 miles to the city limits, where it will connect with the city water mains Crossing the Valleys.

While the boring of the mountains by tunnels is suffi-



Excavating canal section of the aqueduct.



Concrete flume used across small gulches.



Carrying water, provisions and dynamite through the mountains.



Steel siphons carry aqueduct over canyons.

of the Halwee reservoir. Its purpose is for regulation of the Hallwee Preservoir. Its purpose is not regulation rather than storage—its capacity being limited to ten days flow of the aquadter. Its purpose is to regulate the flow into the Elizabeth tunnel, through which the water will flow to the seward side of the const range The reservoir covers a surface of 165 acres.

The Dry Canyon reservoir is a small reservoir, a few miles from the termines of the aqueduct.

Two reservoirs are in course of construction in San

will be inrge. for irrigation purposes, it is anticipated that the most prolific source of revenue, with which to meet the prin-cipal and interest on the bonds which have been and will be issued for the construction of the Los Angeles aqueduct, will be the sale of electric energy produced by the water of the aqueduct in its descent from an altitude of 3,812 feet at the intake to its outlet in San Fernando valley, 1,461 feet above the sea level The construction of the power plant is an independent (Concluded on page 371.)

clently difficult, the task of carrying a great flow of water neross the valleys is 11ttle loss In many in stances it is much more diffleult. In some places this crossing was done by building the condult of solld ce ment, supportof the sume material More frequently, however, the vallevs me crossed by means of very large steel slphons, with a diumeter of from 714 to 11 feet, built to stand a pres sure up to 350 pounds to the square lach There are on the line twen tathree of these siphons, with an aggre gate length of 1206 miles. crossing as many canyons The only rock siphon on the line--that at Sand Cunyonon trial falled to stand the pressure, and is now being rebuilt of steel

fied. tlan of the work us it has been carried on t. extending from the miet gates to the outlet on the tim of the San Fernando Val lev, meludes tion given on Dage 371.

Aqueduci Work Classi-

Generation of Electrical Energy.

the sale of wathe use and the surplus, which for many years

# Hugh Lincoln Cooper

## The Man Who Built the Keokuk Dam Across the Mississippi

By Will P. Green

PERREVERANCE is the keynote of the success of liquh Lincoln Cooper, chief engineer of the £27, 500,000 power development dam across the Missistoph River at Kookuk, Iown Cooper persisted in pushing the Keskuk project to completion when men of less determination might have abundanced their plans, with the result that to-day the concrete monolith stretching from the Illindus's to the lows shore stands not only as a monument to engineering skill, but also to the tennelous spirit of American engineers.

Mr Cooper states that fifty-eight expitallists showed him out of their offices before one man could be found with the confidence to hivest his money at Keokuk. Many of them kinex that the necessary power was in the Misod-suph, and more of them were acqualated with Cooper's standing us an eighteer. Investigation, on the other hand, and opinions from eminent engineers, were to the effect that conditions at Keokuk were possular to the extent that a trainfus wheel never had been built to meet them. "That's all right," was Cooper's answer. "Then we'll build one outereleves." And he

"Then we'll build one ourselves." And he did, designing a turbine wheel specially suffed to the conditions, and when the plant is entirely completed, thirty of these wheels will be developing the maximum power of which the Keckuk dum is enjoine.

When Couper flowlly found money to finance, the Newlan Project, It was not American capital. Singlishmen, in fact, seemed to have the greatest conflictness in the ability of the American engineer. They had seen blin drive a runnel under the center of Horseshoe Palls at Nispara, and in addition to that he had built a number of great water power plants in foreign countries, unung then Brazil, Mexico and Januslea, and one at McKall's Ferry on the Susquedminn. The total amount of capital showed that sixt-five per cent of it came from England, Prince, Canada and Beighm, and thirty-free per cent from the United States

In constructing the Keckuk dam tooper was confronted with some stupendom problems; an instance of which was the lattle with the lee during the spring of 1912. From the beginning of the construction period it was evident that the worst conditions would be met by the lower confrontment with the constantly in mind when he dayned the theory of the constantly in mind when he designed the cofferbain, and the methods of meeting the attacks were thought out far in advance of their coming.

The lee in the Misobodiph usually breaks up in March or April, and moves down the river in large calcs, often 400 or 500 feet square. As it floats down stream, the contact with watmer water and numerous obstructions usually breaks it up into a mass of smaller pieces. The momentum and pressure of thousands of tors of see thus possing down a river

It is difficult for the layman to comprehend. In the spring of 1912 the construction had so far progressed that there was a clear space

between the dum as it had been completed from the litticists side and the lower cofferdam of about 450 free! The openings of the bidge pleas were closed so that all of the ice was faced to pass our through the single opening between the end of the dum and the cofferdam.

The lowe coffeeding consisted of a stransverse line of cribs at the north and of the power house site, extending our about 1.200 teet into the tiver. The cribs had on their outside force i line of vertical plank sheeting, and outside of this a clay emianisment. The apstream side of the embodiance that been covered over which loses racte to dividite the searching action of the current. At one corner of the cofferding a wing of eribowch was built to throw the current out neutre the center of the river. In preparation for resisting the fee action it was expected that be doubted down the river would strike the apstream tog of the cofferding, being through our up on the inclined surface of the rock protected fill and forming in itself a burrier to defect the tee following out bird the middle of the river.

The fee was from two to three feet in thickness, and so into was the spring that Mr. Coper thermed that a large quantity of ice probably would be released at one time. In order to afford additional protection, additional cribs were built, armored with loder plate. Part of the crib construction was built four feet higher and loaded diews with rock.

and loaded down with rock.

The first break in the ice lodged quite a field of it in the opening between the Iowa coffordam and the

Illinois coferdam. Men were on duty day and night to patrol the orderdam and to watch for developments. It was 2 colock on the afternoon of March 23rd when the see above the cofferdam resulty broke and started downstream. As had been expected, the advance flows the desired and the contract of the cofferdam, finally piling back on the to-following and forming a great hand. Orest quantities then began to wedge through the opening in the river. The cuttre defensive conservation withrough the opening to the contract of the started of the starte

struction withstood the attack perfectly.

But a gorge soon formed several miles down the river, and the stage of water at Keokuk went up to a point higher than the cofferdams ever had been called upon to withstand. The gorge broke, and the river foil. Again a gorge formed, and the river rose to seventeen foet. The cufferdam was designed for a twelve-foot stage; but the filling had been carried up so that it really was good for sixteen feet. Cooper ordered the cofferdam raised higher still, and night and day steam shovels and a force of men kept pace with the rise of

Coyrigh by H. M. Annhais

Hugh Lincoln Cooper, C.E.

Who designed, financed and built the great Kookuk dam across the Mississippi,

the river. For two weeks a flood stage ensued. Design points appeared amount without warning, and prompt action was always necessary. When the water was at its lighest, windstorms threatened to undo all prompt action was always necessary. When the water as the flow of the stage of the properties of the stage of the

High L. Cooper was born in Houston County, Minnesota, and he was still in his forties when he built the
Keckuk power dam. As a boy he grew up with water
wheels. His schooling was limited, and observation
made up the greater part of his education. His father
was a water-wheel owner and builder, and the boy
carly erinced a keen uirerest in the engineering idee of
the work. His first real work was with a bridge construction, company, but Cooper always had hydraulie
engineering in mind, although his initial work as an
engineer in business for himself was in the construction
of a bridge in Washington.

Later he went to foreign fields. Cooper has a great

respect for foreign labor, and even now he stops with interest to watch a Slav or Balkan on the 50b. The countries in which he worked have already been mentioned. He returned to America to build at Niagara, and later on in the Mississippi.

After completing the project at Kookul, he desided to take a six months' vestion in Burope, and there he is at the present time. This master engineer shrinks from publicity. When the great Kookuk dan was dedicated, he was among the missing. Purposely he wanted to a wrist the motoriet; mentioned with it. His personality in the state of the motoriet of the personal with the state of the motoriet of the motoriet with it. His personality is not the state of th

#### Treating Deafness by Electricity

THE partial deafness connected with inflammations of the middle car is considered incurable in many cases, and patients must be content with get-

cases, and patients must be content with getting rid of the original affection (suppuration of the middle ear, etc.). As regards otoscierosis, both the affection and the concomitant deafness may be said to be incursible.

Dr. Hamm, an ear specialist of Brunswick, Germany, has devised a new method for healing partial deafness in such cases, especially in young people, by electric heat effects (diathermy) on the tissues of the ear, by means of a special device designed by Prof. Feukert of the Brunswick Technical Haft School.

The ototherm, as the new apparatus is called, comprises two disk electrodes—one of hich le fixed and the other rotatable—con-ected up to a circuit into which a capacity and a self-induction coil are inserted. The two electrodes are arranged in front of each other, at a distance of a fraction of a milliinterval being taken up by a layer of oil or alcohol, renewed by a continuous sup-ply of liquid. The movable electrode is set rotating by a small electric motor. The two electrodes are surrounded with a sheet metal cover, preventing any projection of oil (or alcohol). A continuous or alternating curr tension connected up to the two electrodes, of course, produces in the oscillatory circuit alternating currents of very high frequency, the number of cycles of which is controlled by loosing a proper capacity and self-inducti The self-induction coil is coupled to another of a tension depending on the number of spires of this coil are produced. The effect of mutual induction between the two colls is controlled by varying their degree of coupling, i. e., by inserting them to a variable distance into each other. The terminals of the second coil are connected up with the electrodes, one of which (a light brass electrode coated with deer skin moistened with warm water) is, before

starting the apparatus, cuttlously introduced as far an possible into the external part of the ear to be treated. The heat generated by the high frequency currents is controlled in as simple a manner as possible by shifting the cells, and is increased as far as the patient is able to stand it. The consumption of energy of the apparatus is extremely low; the ototherm is connected to any scedigi like, an electric issue in the varies from one person to the other, being even different for the left and right ears, respectively. The duration of a sitting is for each ear five to ten minutes, and the number of siftings one to three per week. Some cases are cured in a fortnight by four to five stitings, whereas others require a treatment leasting several mouths. Any cases' susceptible of being cured by this method show already after the first sitting a notable innorevenent.

In view of the satisfactory results obtained in a number of cases. Dr. Hamm does not hesitate to declare that dothermy is a therapeutical process, silowing chronical affections of the tympanum and chronical inflammations of the middle ser (oitile) to be cured. It affords a means of combating the partial deafness consecutive on supportation of the satisfies ex, even in case this requires an extensive suspical operation. Ottobercy staple or contribud (with firetigate) traitment, would also seem at least to improve certain cases of otostiss-

# Plager Print Detection by Chemical Moun

"I HE downess method of making finger prints clearly a 'taible is to optimize taitum powder, or a luminium powder or a preparation of chaik and maccury over the suspected spot, and then brush the spot slightly with soft examels harb treath, when the lines of the finger tip show up in white. The writer has recently discovered another way to secure these impressions in black or brown black, by chemical means. If a finger print is made upon a plece of hard-surface paper, or an impression of the thumb or both, a very fine powder of dried accetate of lead may be excitated over the places where these impressions have been made and then the superfluous powder, after which the spot should be submitted to the fumes of a spublic of ammonium. The markings will then develop immediately into bold clear lines of a brown black color, due to the formation of sulphide of ammonium.

If sheety powdered dry obloride of allver be used instead of acctate of lead, the sulplus powder being removed in the same way by tapping the paper, it will be found that on exposing the paper to the action of light (eunlight if possible) the finger prints will develop perfectly. Of course from these developed impressions a negative may be made and prints made therefrom, either by direct printing, or by development. It has been found by testing that if the paper em-

It has been found by testing that if the paper employed for this class of work is coated with plain colcidion so as to make it non-absorbent the impressions
become very brillian, and can be fixed by floating the
paper back down upon a mixture of suiphuric ether
and alcohol in equal parts, the penetration of which
softens the colicidion entrace, causing the sulphide of
lead, or reduced silver chloride to athere. A finger
print upon a glass tumbler, a glass pane, or upon office
brass work can be brought out distinctly in black by
placing a place of white paper in the tumbler in cylinder form. A negative can be readily made from the impression. Accetate of lead appears to give blacker impressions with the sulphide of aumonium. The access
panying photographs abow flanger prints readed visible
by sulphide of lead and by chloride of silver developed
by light.

#### How Telegrams are Sent in China By R. E. Chambers

THE Chinese written language has several hundred thousand different characters. None of these can be spield so as to indicate accurately how they are pronounced. Besides there are hundreds of ways of pronouncing such character, as there are hundreds of spoken dislacts in China, sithough the book language is the same throughout the country. How is it possible to send a telegram in such a country and in such a language? The difficulties have been overcome, and it is really less trouble, and less expensive to send a message in Chinese thap in English.

The telegram published horsewith will help to make

The telegram published herewith will help to make the matter pisin. There is in every Chinese telegraph office a special dictionary, or catalogue, or code book, whatever you may choose to call it, in which the characters are numbered from one on up. A total number of 9,000 may be catalogued under the present system.



Dinese telegram showing the number cole.



Finger prints rendered visible by sulphide of lead.



Finger prints developed by light after treatment with chloride of silver.

A certain number of blank spaces have been reserved to add special characters from time to time. The sender of the telegram simply writes his message in the usual way. The operatio will probably know the numbers of most of the characters. If not be can readily find them in the catalogue. For each character he sends a few flower signais, e. g., 6013, 6013, 6014, which represent the characters "Yuan Shi Kai," the name of His Excellency, the president of China, who sent the telegram here reproduced. It will at once appear that only ten different signais are needed for telegraphing 9000 different characters in Chinese. By splitting up an unusual character into its common parts it may be easily sent. Private codes are readily prepared with





Fireman's smoke beliet with intake near the floor.

this system. Already the chief cities of the country, and many small places have telegraph offices It hoped that under the republican form of government the whole sevrice will be extended, improved and made increases to mention that the telegram published berewith is an appreciative reply of President Vian to a telegram which the writer as president of the China Baptist Conference sent to him upon the occasion of the call for special prayer for China. In addition to the ordinary wire service, China now has several powerful wireless stations, and arrangements are being made to cover the country with them.

#### Transforming a Schooner into a Grain Lighter

S HORTLY after the directors of the port of Boston succeeded in getting the Hamburg-American Line to shift a part of its lustiness to Boston, it was discovered that there was no grain lighter in the harbor with sufficient elevation to load the new liners.

aufficient elevation to load the new liners.
In this emergency the achoner "Bilen M. Golder"
was secured and practically stripped. She is 103 feet
long overall, by 55-500 bound of 650 tonnage. Rine
with a capacity of 22,000 bushels were built in the buil,
An engine was then installed in the sterm and goard to
a shaft running forward to a point about haif way to
the bow where a rope shave trunsmitted power to the
head shaft of the twe main 20-inch bucket elevators.
To feet showe the deck.

At two points between the engine and the rope drive,

power is taken off through gentred to one point to drive two cross shafts provided with rigorebands which serve to move the lighter backward or forward to a better to move the lighter backward or forward to a better to shaft which in turn operates a secondary shaft running shaft which in turn operates a secondary shaft running the lengthwise of the schooler. The latter serves the end as a head shaft for the two 16-linch distributing elevators.

The lighter is loaded to its full capacity at a grain elevator and rowed alongoide of the litter to be loaded. The capacity of the lighter is equal to a day's work for the main elevators which draw from the bins amidships, and the smaller distributing elevators for and aft deliver grain to the main bins at a rate which insures all the hoppers' emptying simulationnisty.

#### Smoke Helmets for Firemen By J. R. Schmidt

THE helmets pictured herewith enable a threman to remain in a smoke filled room for an Indelhilte length of time without resorting to the new of oxygen tanks to sustain life. They have recently been adopted by the fire department of Cleveland. The new device consists of a canvas bood, somewhat similar in appearance to a diver's belinct, with index squares admitting light. This first closely over the head and shoulders. From it trails a hose which reaches down to the floor, through which are is carried to the warer

As bested snoke, fines, etc., have a tendency to rise, there is, ordinarily, more free oxygen in the snoky here to conclose to the floor. In walking around in a snokes taken from the hearter the behands breathers the air taken from the hearter of the behands the taken from the floor by the traditing hose. Air vulves in the top of the helmest affect scene for the exhalted air so that a freely supply is always received from the exhalted floor. To prevent the hone from collapsing a spiraling runs fits entire length and a heavy end keeps the hose always mear the floor. Experiments have shown that a person can remain in a snoke haden room for vantages of this helmet are that it dispenses with heavy studyed to oxygen takes and may be worn by man or woman of any size, to whom it may be adjusted in less than a minute's time.

#### The French Prohibition of Inflammable Celluloid Films

A FTER December 1st the ordinary celluloid moving picture may not be used in France Instead an uninthammalie film must be used Thomas A. Edison issued the following statement when informed of the new French law:

"There is no possible material known that takes the place of the present collision film. In this country the longurance companies have been so strict that everything pertaining to the film and machine is tnessed in tron and assesses so that the clume of a fire is reduced almost to immunity. Out of 13,000 moving picture theaters we searcely ever hear of a fire, although the theaters are ranning sineset continuously. The muomit of fins stored in the treperod booth at any one time is so small that it is difficult to finastine any danger to the theater even if the whole unmuni should have up. A properly designed machine provides fumunity aside from the fireword footh."



Schooner converted into a grain lighter.

# What Are the Ten Greatest Inventions of Our Time?

## The Second Prize Article in the Scientific American's Invention Contest

By "Altair" (George M. Dowe, Washington, D. C.)

Wilen one considers the vast number of inventions of our time, and endeavors to compare them as to their relative importance, there is suggested to the mind, as a basis of comparison, the inventions of other times, and also the question of the origin of inventions generally

may perhaps be accustomed to think that all inventions are of comparatively recent origin, but a glance at man even in the savage state, will indicate that such is not the case.

in man's earliest struggles for the means of sub sistence, he was obliged to invent some means to sid his natural powers in procuring his food, his shelter, and his clothing, or else lose in the race with other animals contemporary with lim, and many of which were more powerfut than he This conflict arose from the beginning. Man could not fly, like the birds be sought for food, nor burrow like the bear, whose skin he coveted for a closk. His problem was to invent missiles that could move faster than the objects of their pursuit, and to create tools for digging and compel burrowing animals to quit their dens. As the modern inventor is ever seeking to improve the instruments he uses, to adapt them more perfectly to his needs, so the genius of early man was engaged in adding speed to his feet, momentum to his fists, and strength to his

ne aspect then the history of humanity may be viewed as the history of the development of man's in-ventive faculty, and thus viewed man has been an inventor from the earliest times and inventions have been made in respanse to needs; in the desire to bring about inter results by less expenditure of effort.

The most impelling of the needs which have stimu-

lated the exercise of the inventive faculty, have arisen from the desire for food, the desire for shelter from the elements and the desire for rest and bodily comfort; and while few and simple in savage times, and won numerous in modern days, yet they may referred back to the same stimuli which impelled the savage to invent the flint tipped arrow or the fire stick.

As man emerged from the savage state and became ore and more civilized, to these primary needs were added others, the most important of which was the need for means of communication as distinguished from transportation, the need for means of transportation having arison incidentally with the production of food itself. This need for means of communication was early supplied by the invention of writing, and after the lapse of centuries, it was further supplied by the invention of printing from movable type

From the earliest civilized times then, it is clear that the most important of muo's activities have been directed to the production of food and the materials for cloth ing and shelter; to the transportation of himself and his products from one place to another; and to means

The importance of an invention therefore, may be judged, by considering whether it has sided in production, in transportation, or in communication, for unless man can procure his prime necessities and trans-port them, without using up all his strength and all his time, he would have no opportunity to develop the fine arts, literature or science, and the civilization of our own time would not be possible. Based on the foregoing considerations, the ten in-ventions selected as of greatest importance are as

Electrical Fluitton of Atmospheric Nitrogen Preservation of Sugar Producing Plants High Speed Steel Tungsten Fliament.	Aid to Production
Aeroplane. Steam Turbine Internal Combustion Motor Vehicle Pneumatic Tire.	Aid tn Transportation.
Wireless.	Aid in

Electrical Fixation of Atmospheric Nitrogen.
For our food we are dependent primarily on the seel A most important element in the growth of plant life as is well known, is nitrogen, and it is an important problem, how to supply this ingredient artificially and cheaply so as to preserve soil fertility. Of comparatively recent discovery are the nitrifying organisms which have the ability to take nitrogen from the air, but owing to the great number of varieties of these or-

Mr. George M. Dowe, the author of the essay published on this page, is the winner of the second prize, value one hundred dollars, in the contest anred in our tasse July 5th, 1918.

nounced in our tesse July 18th, 1915.
Mr. Dovo very systematically classes all common human activities as relating either to production, transportation or communication, and then considers in turn the principal contributions of recent inention to each of these fields.

The atmospheric firstion of nitrogen on an in

The atmospheric fleation of milrogen on an in-dustrial scale abone signs even at the precent day of rivaling in certain the production of nitrogen compounds from other, longer established, but less incabausible sources. There can be little doubt that Mr. Dove is right in placing the development of this industry at the head of his list of inventions relating to Production.

Aids to Transportation show a particularly bril int record of new developments during the last thems record by the descriptions as which is also the themselves of the description of the department, though only the future can show just what the aeroplane is yet destined to achieve

And as to aids in communication the lives that have even now been saved by scircless telegraphy, who can doubt that in this field the inventions of Hertz, Marconi and the other pioneers of electromagnetic wave signalling stand first!-

ganisms, it has not been found entirely satisfactory to use them for increasing the supply of nitrogen in the soil, so that fertilizer in the form of Chill saitpeter is used to an enormous extent.

The question that naturally arises, is the quantity of sterial availab

Based on careful calculations, Mr. Edstrom, in a paper read before the American Electro-Ct ciety, estimates that the mines in Chili will be ex-hausted about the year 1940.

The discovery, therefore, of a process commercially

The discovery, therefore, of a process commercially practical, by which the exhaustiess altrogen of the atmosphere may be imprisoned and used to support light it is, is to be welcomed as a great cphierment. It has long been known that the electric spark, passed in air, produced a combination of the oxyge and nitrogen, giving an oxide of nitrogen. The problem was to do this on a commercial short. do this on a commercial scale.

Through the efforts of Bradley and Lovejoy, and Birkeland and Eyde, apparatus have been perfected by intectand and xyue, apparatus nave occur percepted by which the electric current is used to such advantage that pure nitric acid can now be produced in sufficient quantities to make the process a commercial success From the acid, fertilizers in the form of nitrates are

made by well known means

Preservation of Sugar Producing Plants. The value of sugar as a food is so well recognized

adays that no argument to this end is needed. In the making of sugar, however, it has been no in the making or sugar, nowever, it has need necessary, under processes until recently known, to get the sugar plant to the presses while fresh, and consequently the entire product must be handled during the harvest cason. This makes it necessary to have the refining plant of sufficient capacity to handle the product in a

Mr George W. McMullen of Chicago has discovered a process of preserving the cane or beets for a long time without losing any of the valuable sugar content.

in the case of beets, for example, they are reduced to a desiccated and finely comminuted condition before the sugar is extracted. The raw material thus treated can be shipped to refinerles having the most approved

apparatus, and the refining can be done at leisure.

The carrying into effect of this process means a a great increase in the supply of food in the form of sugar and therefore places the invention among those of the greatest importance to manking.

High Speed Steel.

The discovery of the method of tempering so-called tungsten steel by which tools made of it would cut at or near red heat, and not lose their temper, can be called nothing short of marvelons.

To make a not for cutting, with a keen edge that would hold, has been so important to man, that in all stages of his history, from the age of fint to the present day, he is found endeavoring to improve its cutting

mpering was very early discovered, certainly before the Christian era, but the practice from the sarties

times has remained substantially the same. Mesers Taylor and White discovered their process

According to all tradition, a steel must not be heated beyond a red heat when being tempered. What could be ver that by more astonishing therefore, than to disc heating tungsten steel to almost a meiting temperature and then cooling, a hardness was produced that was heretofore unknown and that tools so made were able to cut at such a speed that they became almost red hot without losing either their temper or their cutting

ut these are the properties of this new ki and its production has doubled at least the cutting capacity of tools made of it. When one can improve a tool or a machine so that its efficiency is increased five per cent it is considered noteworthy, but when the gain is one hundred per cent, the achievement is nothing short of revolutionary.

Tungsten Filament Lamp.
The production of fire by artificial means has been stly regarded as the greatest invention in the history of the human race. From the illumination of a fire to the Masda lamp of to-day is a great triumph, but the step from any one to another and better of the various illuminants which have marked man's progress no greater than has almost yesterday been me the step from the carbon filament to the tungsten file.

The very great importance of the new lamp can be preclated when it is remembered that the tungsten is remembered that the tung lamp gives the same illumination for a little more than one third of the energy required for the carbon lamp.

To Messrs. Just and Hanaman of Austria is due

the credit for the discovery of the process by which a tungsten filament could be produced which was coherent erent and homogeneous It remained for Dr. Coolidge how-ever to unfold a process by which tungsten could be ssfully drawn jute a wire and by which the perfected lamp of to-day is made possible.

Aeroplane.

It has been suggested in the early part of this paper, that transportation was incidental to production. In fact, it has sometimes preceded it, for before the man woods could catch his game he had to transport himself to the place where the game could be

The means of transportation used has varied with the surroundings. In the frozen lands, the sledge and snow shoes are the aids in the briered wood, leggings as well as shoes were worn. Each of these device increased speed and saved time.

It is in the race with time that man has made re alde progress. Fast bosts and fast trains now take him from place to place and the time devoted to the procuring of the prime necessities, is being ever reduced. To these achievements by land and sea, has now been added another, the conquest of the air, thus widening still further the field of available modes of transports tion.

To Laugley and to the Wright brothers must be awarded the chief honors in the attainment of mechanical flight. Langley furnished an immense amount of data upon which the Wrights worked, while they found out what was necessary for stable flight.

Steam Turbine.

The steam turbine marks a new era in the utilization of steam as a prime mover. Its introduction has brought about a revolution in the design of high speed machinery. It contributes to production and also to transportation; to production through its application to the generation of selectricity; to transportation through its application to the swiftest steamers.

Mr. Parsons, to whom the greatest credit belongs for the introduction of the turbine, has performed a service which surpasses in importance all improvements in the utilisation of steam since the days of Watt.

Internal Combustion Motor Vehicle.
The wonderful clasticity which the internal c

tion motor vehicle has given to transportation gives it a place among the greatest modern invention this is not its only field of importance. It It has been applied in production also, and it is in this field that its use is beginning to be more and more approchated. fit use is businning to be more and more appreciated. Not only in the large tractor by which several farrows, say plowed, hardward and seeded at one operation, but to the small implement for first use in the wooderful adaptability of this form of "whiche shows." While numerous laysuators have contributed to the development of various spirits suspirile prior the gentlement while to the contribution of the contribution of the development of various spirits suspirile prior the gentlement while of to day, the issuate strong, promiserably connected

(Constatot en page 1753) 2.1944 C. 1933年高級

# CENTLY PATENTED INVENTIONS These columns are open to all patentees. The motions are inserted by special arrangement with the inventors. Terms on applica-tion to the Advertising Department of the Scientific American.

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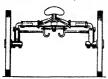
Perfecting to Appeared.
CONVENTIONED FUR PLACE.—G. Brevest,
ddy R. spb At, Manhetta, N. Y. N. Y. This
notes wraps in in the nature of a fur place,
notes wraps in in the nature of a fur place,
or purpose to another so that the owner of
the garment at one time or for certain occuplaces may use the places, for instance, as a
sofer, and again, as when wearing a fur cost,
they nate convert the cent into a most of either
the rung or plinted design.

#### Electrical S

RIGALING Devices,
RIGALING DEVICE FOR ENTIMATING
DISTARACER.—J. U. SHITH. 2320 Ward St.,
Berksley, Ca. I. The invention comprehands the
use at the transmitting station of an oscillator
for Sertian ways, or their equivalent, which
trawel directly through the either at the speed
soler water for propagating aconstic disturbances, the receiving station comprehending a
wave detector responsive to the oscillator, and
also including a sound-controlled triephonic
transmitter, this and the wave detector being
arranged to control currents passing through
a templone receiver.

CULTIVATURE—J. B. Thereical investion of C. Vascu, Randford, Inn. There is the rest of investion that the control of the contr

CULTIVATOR.—V. LAURR, Stillwater, Okia The injention here is to provide a wheeled device wherein the wheele are so connected for the cultivator that the driver may simultaneous-



CULTIVATOR

ly swing the wheels with respect to the culti-vator to change the direction of anyocuent of the cultivator, and may hold the said wheels at any dealred angle with respect to the culti-vator.

Of General Interest,

RLUF PRINT FRAME — J A HIBSTERSO,
215 N 20th N., Manhattan, N Y, N Y, and
J. W. Harvings, N Y, N Y The primary object of this invention is to so manute a plural
ity of binding strips upon the main frame
and to operatively connect them as to make
them all operable annutraneously by a single
morement of an actualing member
(CONCA) BROWN CONNECTION (CONCA)

movement of an actualing memory of PMLLs, Cottagebill, Fis. In the present patent the invention has reference to concrete construction, and it has for its object the prison of modification and the set of the object window frames, and means by which the sash pulsays and weights many be disposed in the concrete frame

weights may be disposed in the concrete traine BOTTLE CLORURE.—R. E. RESDIAM, 1325 80. 9th St., Terre liaute, and The invention provides a closure which is more annitary than the ordinary peateboard disk. This is due to the provision of a cloth strip which forms an



MOTTLE CLOSURE.

auxiliary rissure member and prevents dist and dust from entering the bottle while the main closure nember is being removed. It also provides a device having a closure of the type described which may be readily taken off or applied to the bottle.

anxiliary rissors member and prevents diet and distribution microling the Dritt while the main closure member is being removed. It also profess a derive haring a closure of the type species at the opposite and and clamping means profess a derive haring a closure of the type short at the opposite end and clamping means observed which may be readily taken of ar that his culture, having only one interested which may be practice. On the state of the principal objects of this threating of the third profess and the profess at the state of the principal objects of this threating of the U-frame may be made. See to provide a fill having a thundel like of the threating the profess of the U-frame may be made.

NUTL LOCK.—W. B. MAYWALL M. W. This investion health and the provides of the U-frame may be made.

seri stonission of best to the metal frame and roriciting parts of the platforms named; to provide a plurality of platforms stranged in conjudicion with the above membrased platforms to confine the heat within certain areas; to profile for preventing postering of air; to adopte the providing representation of an and to provide means for resisting east of a sagre higher than that required for the turning of material being handled.

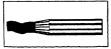
DEVELOPING TANK.—J. H. DROSSER, DEURYLE, ATE. The aim of the investor is a series of the provided to the turning of the series of the series



DEVELOPING TANK.

during the operation, together with a pinral ity of anxiliary tanks for containing the var-ous fluids, supported in the main tank an uneans in connection with the main tank to holding one of the auxiliary tanks of the mai-tank.

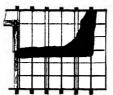
PENCIL—J. A. Walls, 39 U S Fidelity Bidg., Balttmore, Md The invention is of ass more particularly for pencils for writing orna-mentagogins and the like. The essential object



ORNAMENTAL SIGN WRITING PENCIL

is the provision of a pencil core so formed that in writing a succession of signs a rthbon-like appearance will be given, which will show a progressive development of atriated form, whereby an erasure or interpolation may be endity detected.

FRERINGOF PARTITION.—G. H. GEBAR ERDTR. 1346 Roone Ave, Bronx, New York N. Y. in order to accomplish the purpose or this invention use is made of freprot boards of planter or the like, set up on edge and



FIREPROOF PARTITION.

abutting at their edges, vertical bars attached to the finor and ceiling of the huliding and in contact with the opposite faces of the set-up boards, and longitudinal rods held on the said larm adjacent the faces of the said set-up

Hardware and Tools,
MICROMETER CALIPERS.—J. H. MOLLER,
1519 E. 24th Ave., Oakiand, Cal. To obvicts
everal difficulties Mr. Multer has invested a
caliper which refers more particularly in the
class comprisings.— W.which refers more particularly suprising a U-frame, having a



removal when desired, the construction, how-ever, being such that the nut is positively decked preventing accidental or unintentional opening thereof.

Machines and Wechanical Devices.

CANINTER BUPPORT — A. Il Cunzar, 24

Hamilton Place, Tarrytowu, N. Y. This in
vention relates to a convenient unchanism for
supporting a canister designed to boid tea,
four or any commodity; and it sain invitudes
means for monsting the support upon various
fatures and for supporting aboves or the like
by the aid of the canister support

by the sid of the casister support
VALVE GRAR—C. B. PILIN, 408 E. 6th
St. McCook, Neb. The invention provides
means for readily changing the lead of valve
gears of the Waischnert type The combination lever is provided with a sint, in which
alidea a block connected with the valve atm,
so that this lever may be raised by a link connected with an operating device in the eagine
ch for changing the lead of the engine.

DATING MACHINE.—E E. Gascoav, Cen-tral City, Ksn. Mr. Gregory's invention re-lates to dating machines, particularly for use in banks, real estate and ion offices, and more particularly to an apparatus embodying stamp-



ing wheels for the years, months, and days of the months, having means for advancing a pre-determined number of days through a single actuation of a certain portion of the machine

for this purpose.

ANIMAI. TRAP.—R. P. Vannez, Cristoval.

Canal Zone. This trap is more especially desizemed for capita calculais silve and uninjured,
and arranged to permit ready concealment,
to perofice access to the trap from every direction eacept the bottom to prevent the cacape
of the animal caught, and to protect the caught
animal rought. and to protect the caught
animal from attack by other animals

animal from attack by other animals PHOMETING APPARATUS—II. KAIROUR, 168 Hown Tace, Bronz Herough, N 1, N Y, and C. F. Daver, assen becomed The laws tion provides an apparatus for use as a disadventisement and the like singly or for use in connection with a moving picture machine to permit the user to display the pictures on the acrees while the film in the moving picture machine in changed.

Pertaining to Recreation.

TABLE ARCHERY—J. Mosknow, Ja., 2½,
Gage 8t, Glean Falla, N. Y. This invention
relates to gauve; particularly archery, the
game being characterised by a target losari
of peculiar construction adapted to le used
with a number of darts or arrows, the ocarciton
of the purta being such that the target will retain the darts and arrows when brought lule
organization. These with engagement therewith

cagarement therewith COASTING DEVICE - D GINGGIA, 608 Wa ter St., New York, N Y. This invention refers to pleasure devices and particularly to devices used especially by children in coasting on pave must by the use of wheeis, or upon snow ard lev by musta of runners - The device is improved with respect to the attering uncrhained and adjustability according to the statute of the user.

Norz.—Copies of any of these patents will be furnished by the BCIENTIFIC ANERICAN for ten cents each. Please state the name of the patenties, title of the invention, and date of this paper.

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Has discovered a valuable improvement for wirelessly
recordinates with the state of the state of

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Protection against fire guard such valuables; as protection obtainable is

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does light, heat and oil affect

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Aebestos Fibre

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They would have an injurious effect, as they are the natural enemies of rubber Tures not in use can be protected from light by being wrapped in black paper and stored in e cool place. Any ull on a tire should be cleaned off immediately with benine or gesoline. Oil 1016. Lubber and destroys its elasticity.

rubber and destroy, as seen and first are practically new or in good repart, and rims in good shape, it will be sufficient to fewer bethen on the care, taking palas to temove all oil and greate from the town of the tree. Wash them whip good aboveg soop and water if the rubber is cut to the fabric, be sure to have the fullyor repaired before using the car again

Is such a thing possible as keeping tires free from constant contact with oil?

This question is raised by these typical paragraphs clipped from book of various tire manufacturers. Dili-gence may do it—but it spells DIF-FICULTY too-in capital letters.

Our study of the effects of oil on rubber convinced us that the effective solution of the problem was oilproof rubber. This we successfully produced in

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Do oiled roads affect treads? ellowed to remain on treeds and weaken them Oil cettee toon oil rubbes and destroy eres to stand in oil at the

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independent adding policy

The Jungfrau Railway (Concluded from page 164.) cier in other quarters makes the Jung frau Pass unique among Alpine view

The railway also materially a the journey, on foot, to many points of interest. The summit of the "Monk" or that of the Jungfrau can be reached in and with the aid of the railway the ourney from Interlaken to Zermatt can be accomplished in a day by a very easy be accompassed in a cay by a very easy route. From the Jungfrau Pass a walk of a few hours over the Aletsch glacier brings the tourist to the beautiful Lake Märjelen, whence a mule path leads down to Flesch, in the Rhone valley.

It had been estimated that the railway

would pay if it carried 50,000 passeng It actually carried 84,000 in annually. the year 1911, and in one day, immediate ly after the opening of the Jungfrau Pan station last summer, it carried more than 2,400, of whom more than 1,800 visited the pass. These figures prove the correctness of Guyer-Zeller's assumption that there are a great many persons who long to enjoy the beauty and grandeur of the ofty mountain peaks and glaciers that they could never hope to reach by their own exertions. Hence the building of the Jungfrau railway should be esteemed as a work of civilization that opens to all the wonders of nature which could hitherto be enjoyed only by a few.

Before long the drills and the dynamite

cartride s will again be at work, and the tunnel will be pushed forward to a poin directly beneath the summit of the Jung frau, to which the visitor will be lifted through an elevator shaft, 200 feet deep

#### The Daniel Boone Idea in Education uded from page 861.)

—and work. The construction of build-ings enough to house 150 boys and teach-ers in three months was obviously a task ings enough to h even beyond the resources of the militant Interlaken boys. Regular workmen and contractors, therefore, built several of the dormitories. But the higgest and most picture-sque the boys designed and con structed themselves. The Interlaken build the visible evidences of the school by their very history and type of construction thus symbolized the overmastering purposes of the institution—the gospel of mind and character training through

The new boy at this school, as at all others, is more than likely to be a speci-men representative of the city. Soft in his muscles, a little softer perhaps in his mental processes, absolutely removed thousands of miles from any real human experience, the Interlaken School at first impresses him rather as a punishment than an opportunity. To his horror he learns that not only is he expected to cast aside his fine raiment for rough and ready clothing, but that there are really only three or four servants at the school, and that the boys do nearly all the work. instinct of the average adolescent citizen, under these circumstances, is outright rebellion. He secretly resolves that he will not have anything to do with any such degrading routine. Such a resolution is easy. Though work is the school's ruling idea, such work is purely voluntary. Any oy can enter, confine all his time to the boy can enter, comme all his time to the academic studies, and leave manual labor entirely alone. No one forces him to do anything; if he is that kind of a boy, he can sit day after day and be waited upon can sit day after day and de waited upon by his fellows—most of them, as he pre-sently discovers, as "good," which means as rich as himself. He can eat the food that others have raised; enjoy the steam heat and electric lighting that other boys heat and electric lighting that other boys are preparing for him; pick the flowers that others have planted; and stroll up and down the walks, and spend his even-ings in the log cabins that other boys like

found himself looked up to—has always been something of a leader. But here things are not going so well. The boys treat him pleasantly enough; but they do not regard him as a hero. Now, every real boy cares more for the approval of his own boy world than the approval of his parents or relations or teachers. the boys make heroes of athletes, he will try to become athletic; if scholarly tainments are prised, he will immediately nanifest a great interest in his books At Interlaken the hero is the boy who has charge of the steam plant, the boy who distinguishes himself above all others at construction work, the boy who is the best farmer. The newcomer quickly perceives that the way to distinction lies in developing callous hands. His attitude slowly changes. His white color disappears; out-ing shoes and leggings supplant his once immaculate footgear.

Thus transformed the new boy b difficulty in accommodating himself to the changed régime. In the morning he rises promptly at six o'clock. There are no bells, no whistles, no Chinese gongs, as there are no rules, no terrifying lis "don'ts." There are only four servants— two Japanese cooks and two helpers—to supply the gastronomic needs of nearly two hundred people. The boys do all rest of the kitchen work themselves: they lay the tables, serve the food, clear away and wash the dishes. After breakfast they spend half an hour setting their rooms in order. The school employs no chambermaids and no sweeps; the boys make their own beds, sweep out the room and have everything in good order for in spection at eight o'clock.

The time from eight until twelve-thirty is devoted entirely to the classrooms. Here the namel school exercises hold away. But conventional fashion; they try to relate the old scholarship to the facts of me Formal discipline is lacking. The boys are not assigned to definite They gather in a circle about the teacher, ask and answer questions. A classroom recitation resembles somewhat the conver es somewhat the conversation of well-bred people. In the science s, the boys in the main, manufacture their own apparatus.

After one o'clock the situation entirely changes. Leaving the dining-hall, the boys gravitate toward a large bulletin board. A hundred eager eyes scan the inscriptions; for here the masters have written down the "assignments" for the afternoon. On the board are written the ames of half a dozen boys, who are ex-pected to spend the afternoon plowing with two sixty horse-power tractors. Another contingent learns that it is to devote itself to corn, anoth r to sowing cow peas; still another to laying out gardens for raising vegetables. If it is winter time perhaps the ice is to be harvested; if it is summer the hay is to be cut and made and the corn crop is to be garnered. A large contingent finds its way into the shops, where tables, chairs, desks, and bookshelves are to be made, all for the e school. A year or two ago the boys made two silos, large enough to hold sixty acros of corn. The immutable rule is that of manual labor; and on a farm of eight hundred acres there is plenty of work to keep all the boys usefully em-

Every afterno boys have plenty of time for play. spring they crowd the baseball diamand tennis courts--their enjoyment not decreased by the fact that they have leveled and staked out these playgrounds ieveied and stated out these playgrounds by their own labor. In fail there is soc-er; in winter skating and hockey and playing. Every night there are gatherings around the fireplaces in their own and the masters' rooms-for study, reading, and conversation. There may be lectures and private theetricals. Occasionally some of the boys decorate one of the halls, invite their girl friends out from La Porte and ings in the log cause that other boys in the late gain; triends out From La Force and himself have put up.

For a few days the new boy may hold little was a dance. At either timesy they den himself also C. Then a certain sense of disconfort settles down upon him. In his to the politosphy that respect respectively other school experiences he has plways jetolese are as essential to a full receded.





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American citisen as corduroy trousers and a sweater. The school's primary purpose is not to make farmers or carpenters or orchardists, but to make men. Its theory in giving the boys this manual labor is the fundamental idea elaborated at the beginning of this article, that the human mind progresses most satisfactority along with muscular and hand training. The product at which the school ultimately aims, therefore, is the sympathetic, und standing, resourceful, clean living, clean thinking American gentleman

## The Completion of the Los Angeles

Aqueduct unlined canal ..... 28 MA2 Open lined canal. ...... 37.168 Covered condult ..... \_K1 900

0.165 Flumes ...... ervolrs ..... Haiwee reservoir tunnel outlet 0.226 Power penstocks and tailrace...

ary, at \$4,490,000. April 10th, 1910. Lo Angeles voted bonds to the extent of \$3, 500,000 for the purpose of partially de veloping the electrical power of the aque duct, which eminent electrical engineer estimate at 120,000 horse-power peak load. It is not the intention to develop the full amount at this time; but eventually, as the demand for power increases, as it into develop all the power possible will undoubtedly be put in. Mr. Mulholland on one occasion made this public utterand on the subject: "I believe that the peop have in the possible power development from the aqueduct an investment which twenty years hence will turn back into the city treasury the entire \$24,500,000 provided for the construction of the squeduct with interest." This opinion is sustained by the hydraulic and electrical engineers een called upon to examine the

The first electric power plant is 47 miles from Los Angeles, at Clear Water Canyon. The water is led from the mouth of Elizabeth tunnel 935 feet down the preof Englandin unless so feet down the power topfions side of the canyon upon the power producing waterwheels, whence the current will be transmitted to the city over high-tension lines. The plant being erected will produce 37,500 horse-power, and it can be increased at this point by addi-tional construction to a limit of 75,000 horse-power. After leaving the wheels of the first power plant, the water will be carried seven miles along the rim of San Francisquito Canyon and dropped down 512 feet upon the wheels of a second pow-512 feet upon the wheels of a second pow-er plant to be built wheaver the demand for additional electrical energy shall re-quire if. A third power plant to develop a maximum of 10,000 horse-power can be built between the aqueduct outlet and the upper San Fernando reservoir. And still another power plant, capable of producing 8,400 horse-power, can be placed on th main trunk line to the city at Franklin Canyon, in the Santa Monica Mountains. There is considerable work yet to be

and ends of the great aqueduct work, such as building distributing systems for the surplus water for irrigation purposes, and for transmission and distributing sys ns for electrical energy. There is a gorous demand for both water and powwever, and the satisfactory c er, however, and the satisfactory comple-tion of these distributing systems, large in themselves but insignificant in compari-son with the work of building the great Los Angeles aqueduct, will be a matter of

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of the Los Angeles squeduct, and to lay the corneratone of a spiendid monument in honor of Chief Engineer Mulholland and his assistants in the great work, to which have been invited the President of the United States, his Cabinet, the Senators and members of Congress, the nov ernors of all the States, engineers of world-wide fame, and other notables, took place November 5th and 6th, 1918.

#### What Are the Ten Greatest Inventions of Our Time? (Concluded from name 268.)

with its early progress are pro of Daimler, Ford and Duryea.

Pasumatic Tire.

If fifty years ago I were asked to name the greatest invention of the time, the answer would probably have been the loco-motive. When a hard smooth tramway was first conceived, the beginning of the future greatness of the locomotive had been made.

what the track has done for the loco-motive, the pneumatic tire has done for the vehicle not confined to tracks. Here the advantages of the track must be pro duced in the tire. Shock must be reduced to a minimum and sufficient traction must be provided. Both these factors the pueube provided. Both these ractors the pneumatic tire possesses to a high degree. By its use, the automobile of to-day is possible, with its high speed and smooth riding qualities, and by its use also the amount of power to pull a given load is much reduced, thereby aiding man in the transportation of himself and his goods.

To the efforts primarily of Bartlett, the inventor of the cliucher tire, and of Dun-lop, the inventor of the wired-on tire, are due the practical results in tire construc-

#### Wireless.

The development of the means of comnunication from one place to another by signals of some kind makes a remarkable chanter in the history of invention. chapter in the instory of invention. Water early man went with a few of his com-panions to a distant place for any pur-lose, it was often of great importance for e left behind to know how their comnanions fared.

cation has always been felt, and it has been supplied in different stages of prog-ress by the fire kindled on lofty hilltops, by the semaphore, by the electric tele-graph, by the telephone, and finally by means of the Hertzian waves. Each and all of these methods of communication have been devised to meet the needs of erce primarily, but incidentally they have contributed to social intercourse.

While the development of wireless ha been of gradual growth, and a number of inventors have been at work on its prob lems, to Marconi must be given the credi of making it commercially practical.

## Composing Machines. While the production of fire artificially

is probably the greatest achievement of the human race, yet the discovery of the art of printing certainly stands high among the great inventions of civilised

From the time of Gutenberg, h until recent times, no substantial change in the manner of composing has been made on a scale which could be considered com mercial. Printing has improved from the rude hand press to the giant rotary press of to-day, but the composing end has stood still until the introduction of two brand new types of devices, the Linotype and the M

fore the advent of the had been made to produce a typesetting machine, and while the actual setting could be done, the problem of redistributcould be done, the problem or redistribut-ing the type was still unsolved. The sug-gestion that types be made with different-ly located cuts or notches was not prac-tical, since that necessitated a change at the type foundry.

solved the problem as practically presented, by making a typecasting device a part of the machine, so that composing and casting are now done at the printing office ne being a co



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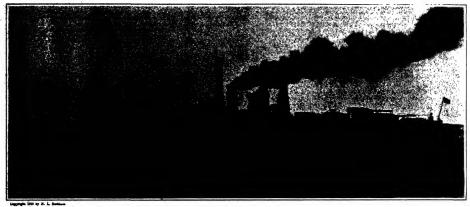
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# The First Super-Dreadnought of the U. S. Navy

The "Texas" Armed With Ten 14-inch Guns. Makes Twenty-two Knots

IN 1910 Congress authorized the construction of two battleships which possess special interest because of the fact that they are the first to be armed with the new 14-inch, 45-caliber gun. For many years—to be exact, since the year 1898, when the "Maine" class of battleships made its appearance—the principal weapon mounted on United States battleships has been the 12-inch gun. This piece was 40 cattlers in length as 12-inch gun. This piece was 40 cattors in length as mounted on the "Ohio" and "Georgia" classes comprising eight ships; 45 calibers long as mounted on the fourteen hattleehips of the "Louislaun." "Idabo." "Kansas," "South Carolina," "Delaware" and "Utah" classes, and 50 calibers in length as mounted on the "Arkansas" "Wyoming."

The appearance in the British navy in 1910 of the "Orion," the first so-called super-dreadnought, marked a return in the navies of the world to gans of a heavier a 48-calther 1814-inch gun, and she showed a great advance in gun power over existing ships. The Bureau of Ordnance of our Navy, however, with wise prevision, and organized of our rawy, income, which was previous, had foreseen the probability of a return to heavier guns; and they had built and tested a fine 14-inch rife, 65 calibers in length, with which, after the appearance of the "Grion," it was determined to arm our future battleships. The two ships vessels "Texas" and "Now

plow. The Least rate to be armset with this formination place.

The 1-4-inch gun to 64 feet long, weight 63.2 tons, has a musale velocity of 2,000 feet gen second, and the weight of its shell is 1,400 polents as compared with the shell of the 13-inch, upon which weights 570 pounds. The musale energy of the 1-4-inch shell is 65,607 foot tone. Its extreme range as assessed in the ship is 25,000 parties, and it can penetrain fill highests of Krupp curier at a same of 0,000 parties in significant for the ship is 25,000 parties, and it can penetrain fill highests of Krupp curier at a same of 0,000 parties in significant for the ship is carried as many fill hand to be ship of the contract of the supplement of the contract of the supplement of the ship is a state of the same of the

water line, \$565 feet; beam, 951/4 feet; mean dranght, 23½ feet. Her normal displacement is 27,000 tons as against the 28,000 tons of the "Wyoming." Her full load displacement is 28,067 tons. She is built as a flagship, and has accommodation for 1,070 officers and men. She is protected by a continuous belt of armor 12 inches in maximum thickness, tapering toward the ends, and above this is a belt of slightly less thickness ding to the gun deck, which deck, amidships, is protected by 6 inches of armor. The turrets carry 14

The armament consists of ten 14-inch guns, mounted in pairs in five turrets, two forward, the after one firing over the roof of the forward turret, and three aft ing over the root of the forward turret, and three air of the malimast, disposed as shown in our litustration. For protection against torpedo attack there is a battery of twenty-one 5-inch guns, ten of which are mounted behind 8-buch armor, amidships on the gun deck, the others being disposed, four forward, four aft, two on the superstructure abreast the conning tower, and one mounted on the guadeck satern.

The "Texas" is a decidedly handsome ship. She is The "Texas" is a decidedly handsome ship. Shie is like the "Wyoming" and "Arkanass" in carrying her main dock flush from stem to steric—there being no break from the forecastic deck to the main deck as in the "Delaware" and "Utah." The main deck conse-

the "Delaware" and "Utah." The main deck consequently rises from a freeboard of 18 feet at it o25 feet forward, and the long, unbroken sweep gives a particularly pleasing outboard profile to these ships.

The "Texas" has vertical, triple-expansion, four-cyllader engines driving two propellers. The designed lones-power is 28,100 for a speed of 21 knots. This, on the trial at Rockland, was easily exceeded, the speed secured being 22 knots, with a maximum on one run of 23% knots. In column with all of our greater ships, the "Texas" has a wide raffund of action. See can carry the "Texas" has a wide radius of action. She can curry a maximum of 2,850 tons of coal and 124 tons of oit. The sister ship "New York" is being built at the New York navy yard, where the is rapidly approaching com-pletion. She is practically a duplicate of the "Texas." except as regards her motive power, which wilt cons of Parsons turbines driving four propellers.

A Tire Tread That Can be Reversed.—In patent No. 1,070,460, Clark Francis Fish of Allentown, N. J.,

shows a removable tire tread made thick along its center and thinner toward each edge, where it is adapted to co-operate with fastening devices. When worn on one ade the triad can be reversed, a filling piece being provided for application between the tread and the tire se when the tread has become worn and is reversed

## The Water Supply of Paris

S HOULD the additional water that the city of Paris requires be brought from the Loire Rivet, the expense will be some \$80,000,000. Such water is of good quality, but us the quantity is but 500,000 cubic meters per day, the project has the drawback of being but a temporary one, soon needing to be amended. A much satisfactory plan will be to bring the water from Lake Leman, that is from the Rhone, where it flows out of the take. As the volume is twenty times what would be taken now, there is ample scope for any future would be taken how, there is aimple scope or any trutar-increase, and it will always be possible to take off what is needed for the city's consumption. To bing one mil-tion cuble meters per day to Purks would cost \$120, 000,000 or one half mure than the above project, but the amount of water would be doubled and the supply would be carried out on much better conditions to the purity of the water, it need only be mentioned that Geneva, Lausanne and other places on the lake never suffer from typhold and other epidemics known at Paris, and even then they take the water directly from the lake without the precuntions which would here be used. The excellent quality of the water is recognized by chemists and bacteriologists of all countries

#### Birds As Consumers of Food

I T may not be thought that of all animals, birds are among the largest eaters This means, of course, in proportion to their weight Some birds are known to consume two and one half thues their weight of food in 24 hours. The heron, which has a light weight of 4 pounds in suite of its size, is a striking example. One as lately caught which had just swallowed two trout

11/2 and 2 pounds Wild pigeons are umong the of 11/2 and 2 pounds ost eaters, and they make a most copious repast ever an abundance of food is found. Thus a single pigeon picked up 1,000 grains of wheat in one day.

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The purpose of this journal is to record accurately simply, and interestingly, the world's progress in scientific knowledge and industrial achievement.

## The Future of the Dirigible

UR contemporary, The Engineer, of London, whose attitude to inventions of the bolder type is nothing if not conservative, affirms that the ill-fated "'L.2' has ceased to exist because it and its brethren of all types, Zeppelin or otherwise, are me-chanical absurdities designed in defiance of Nature's

So much for the ship of the air; and yet it com So much for the ship of the air; and yet it comes to our mind that some titree quarters of a cettury ago, the ship of the see was subjected to a similar whole-sale condemnation. History for its it radiatory? relates that a certain worthy doctor, in the days when it was proposed to build a steamable to cross the Athuito, proved to an absolute demonstration that such a slip would size under the load of free which it would be cessary to put aboard to carry her from coast to

In all candor we have to confess that, in the earlier years of Zeppelin's experiments and those of Lebaudy and others, we were as skeptical as to the success of the airship as The Engineer was and evidently continues to be; but we are free to admit that in view of the steady creeping up of the speed of the dirigible and the continuous increase in its radius of action, and after seeing the Zeppelins daily traversing the air with ility and with from two to three times the speed of the steamship, we have come to the conn that the dirigible has an assured future and a useful field of work.

Conservatism is a most valuable quality and neces-sary to the orderly development of invention; and there sary to the orderly development of invention; and there is no doubt that the very litelligent analysis made by our contemporary of the various disasters which have happened to former Zeppelius has rendered good service in the development of the art. But when the same tournal states that the obvious lesson of the recent disaster is that "no dirigible halloon has yet been con-structed which fulfilled its function otherwise than by structed which minimal his function directive than by dodging the forces of nature" the least that can be said is that the statement is finity contradicted by the facts. So far from dodging the forces of nature, both the construction and the operation of the dirigible are based, as in all successful inventions, upon a recogni-tion of the laws of nature and a co-operation with them in securing the desired results. The buoyant, engine-propelled, rudder-controlled dirigible covering, at a speed of forty to fifty mlles an hour, the greater part of a nd miles of travel within the twenty-four h is built with the same intelligent recognition of and co-operation with the forces of nature which during the past century has brought the steamship to the stage of perfection represented by an "imperator" or a "Maure-tania." The Zeppelin "I.2" which embodied only about sixteen years of development of the airship, about sixteen years of development of the airsaip, was capable of traveling all day at a speed of 55 miles an hour, and at a cruising speed of 86 miles was cap-able of making a continuous flight of 2,500 miles.

In the face of such facts, and admitting that this stage of development has been reached at the cost of many deplorable failures, we think it is altogether too early to state that the Zeppelin and all its brethren of ever type "are mechanical absurdities design in defiance of Nature's forces.

But to leave generalities and come more closely to our text, we invite the attention of the Engineer to the fact that these airship disasters are entirely preventable. They may be classed under two heads: Those that are due to collisions with the ground or the sheltering langars, and those that have been caused by explosions As regards the former, the Schentire Asset. CAN has always held that the ship of the air should be

maintained in the air, and should never, except in emergency, court the risks of destruction which are entailed in making a landing upon the earth's surface, Many years ago we pointed out that the logical pro-vision for landing would be to erect lofty steel mooring owers (docks, if the name be preferred), to which the towers (docks, if the name be preferred), to which the airship would come up from the leeward, casting her anchor into a suitable circular framework, attached to a turntable which would allow the dirightle to float always to the leeward. Figetimes for gas and fuel would extend to the top of this tower, and by means of flexible connections, the floating dirigible could se-cure such replenishment as was needed. Elevators would carry passengers and crew between the landing

Now under such arrangements the airship would remain affoat until such time as repairs might be neces-sary, when, like the ship of the sea, she would enter drydock. We believe that the function of the shed or hangar should be confined purely to docking work, and that the dirigible should be docked only in calm weather.

that the dirighle should be decked only in calm weather.

As regards the risks of, explosions, we are of the
opinion, as stated in a recent issue, that these are entirely preventable. No far as the engines and their
fuel are concerned, there is no greater risk of explosion in the motive power of an airship than there is in that of an automobile or of a Diesel-engine-driven steamer. The risk comes from the leaking hydrogen and its mix ture in explosive proportions with air; and this as we showed in a recent issue, can be successfully guarded against by providing blowers of sufficient capacity to sweep the escaping gases from within the outer en-

The dirigible has an assured future, at least as an arm of the military service; and the many disasters of the past will no more prevent its inevitable develop-ment, than did the shocking fatalities of the sea which

#### A Cycle in Naval Gun Construction.

The fact that our latest battleship, the "Texas," which has just completed its trials, carries as its principal weapon a 14-inch 63½-ton gun, and the recent launch of the "Quene Elizabeth," which is to mount a 15-inch 90-ton gun as its main armament, coupled with our knowledge of the fact that one lead-ing naval power is just about completing for test a huge piece of 16 inches caliber, reminds those of us who have followed naval construction during the past twenty-five years that naval armament, at least so far as regards the caliber and weight of its guns, has been developing in a circle; and that with respect to size

aversoping in a circle; and that with respect to size and power we have, relatively, reached the position from which we started some three decades ago.

To be convinced of this, let us consider the armament of the leading battleships of those navies of the decade 1880 to 1890 that stood in the front rank. The most verful ships of that period were, strange to say, powerful ships of that period were, strange to say, ships of what most of us have thought was a purely modern type, i a., the battle-cruiser. The Italians, who have ever been noted for blazing the way in pioneer naval work, set affoat two ships of the then unprecedented size of about 16,000 tons, which carried no arm a heavy protected deck and an armored ammunitio tube leading to heavily armored redoubt, and which embodied the remarkable combination of the then high ed of 18 knots and an all-big gun battery of four 17-inch guns, each weighing 105 tons. No one will deny that here was the prototype of our modern Indomitable

At the same time Great Britain possessed heavily rmored battleships carrying each two 110-ton 10-4 inch guns. France was represented by the "Admiral Baudin," which mounted three 14.5-inch guns. Germany had scarcely begun the construction of her mod ern navy, nor had we in the decade from 1840 to 1890. Italy in 1888 discarded her 105-ton guns and armed the "Re Umberto" with four 12.5-inch, 67-ton guns. This piece, like all the earlier guns of the Italian navy, was of British make, and in 1898, the "Royal Sovereign" class was armed with four guns of the same caliber and weight. In 1891 Germany started her battleship fleet with the "Brandenburg" class, which were armed with four 11-inch guns, while the United States brought ont the first three of its battleships, the "Oregon" class, which were armed with four 18-inch, 35-caliber

In the British navy the 13.5 caliber gun con to be the principal weapon until the appearance of the "Majestic" class in 1895, when the caliber was reduced to 12 inches, the ships of that class carrying four 95. to 12 inches, the ships of that class carrying four 35-caliber guns of this caliber. For the next thirteen years, battleships of the British navy were armed ex-clusively with the 12-inch gun, which was increased in length to 40 calibers in 1808, 45 calibers in 180d, and 50 calibbre in 1908.

The French navy adopted a 13.4-inch 42-caliber gun in 1891. In 1893 they armed the "Carnet" and following ships with a 12-inch, 45-caliber piece, and in 1904 they

were still using the lib-hole gan, mounting it upon the "Justice" and sheer ships. Their laisest ships of the "Normandy" class, will carry twice in in-4-sec, gues sounced in three four-you turrets. In the decade 1800 to 1800, the United States Navy Proceed the 12-inch gan, which was mounted in the "Oregon," the "Kennenge" and the "Albesta" classes.

"Kearserge" and the "ARbenna" cames. The 12-then gun mounted first in the "Iowa," 1898, was reintroduced in the "Malne" class, and continued to be the principal weapon of our battleships until the appearance of the "New York" and "Paxas," the length being gradually raised from 40 calibers in the "Maine" class to 45 in the "Connecticut" class and 50 calibers in the "Arkansas" and "Wyoming."

Germany's first ships of the "Brandenburg" class in 1891 carried, as we have seen, four 11-inch 40-caliber guns. The next two classes comprising ten ships, mounted no gun heavier than a 9.4-inch, of which each mounted no gun heavier than a 8.4-lach, of which each ship carried four. In 1804, in the "Deutschland" cleas the Germans returned to the 11-lach gun, and this plees formed the main armanent of the "Nesseau" class of 1808 and the "Heigoland" class of 1908, the calibration of the state of 1808 and the "Heigoland" class of 1908, the calibration of the state of 1808 and 1 it is believed that they will mount a new 15-inch Krupp piece of great power.

tters now stand Great Britain is mounting on st dreadnought a 15-inch 45-caliba-As matters n As matters now stand Great Britain is mounting on her latest dreadnought a 15-inch 45-caliber gun, Ger-many a 15-inch 65-caliber gun, the United States a 14-inch 45-caliber gun, Italy a 15-inch 45-caliber gun, and France a 13.4-inch 45-caliber gun.

Although none of these weapons except por German piece reaches the great weight of the 164 inch 110-ton gun of the "Italia," their striking energy is vastly greater. In flatness of trajectory, in the extent of the danger sone, and in the rapidity of fire they are naurably superior to the great gun of twenty-five

## Sir William Preece

T is a fortunate thing for this world that many of its great men of genius are gifted with a physican that physique that preserves them to a ripe old age, is is not the time and place to discuss the reasons for this observed fact; we mention it only because it is once more brought into prominence by the decease,

at the age of eighty years, of a pioneer of applied science, Sir William Presce.

A man of science may render services to the com-munity in two ways—either by advancing our knowl-edge of and control over the forces of nature, or by directing, in administrative capacity, the work of others in developing scientific and industrial enterprises.

Sir William Preece has ministered to the world's sir whilm rrece has ministered to the world's needs not by one or the other of these two avennes, but by both. As an investigator he was one of the first to turn his attention to the possibility of transmitting electric signals to a distance, without the aid of wires. In 1893, two years previous to Marconi's epoch-making contribution to the art of wireless telegraphy, he su cessfully signaled to a distance of over three miles by electric induction, i. e., without the use of a wire nection between the sending and receiving station e of a wire con-

nection between the sending and receiving station.
To kir William Presee are also due important improvements in the field of multiplex telegraphy by wire
and in railway block signaling. He is said to have
inkroduced the electric bell for domestic services in
England, and to have been the second man in his country to employ electric lighting in his home.
His administrative work was divided into two periods.

His auministrative work was divised into two persons. The first sixteen years were spent in the employ of the Electric Telegraph Company, which was dissolved in 1870, its functions being taken over by the Crown. In consequence of this Six William, then Mr. Presce, entered the Post Office service, in which he remained for twenty-seven years.

Sir William Proces visited the United States several sir william rreces visited the United States several times, bringing over with him some of his innovations in the field of telegraphy. His expressions of regard for our nation and his appreciation of some of those characteristics of which we are justly proud, give him a special place in the memory of the American p

Constructs Side Still Trutblesome.—The locus and mutei-tile character of the material of which the Constructs of the component of the construction in their structure of the construction in their structure of the construction o

#### Engineering

Anatesi Speed Test of Our Destroyers.—In the remot aminsi speed test of the torpedo-best destroyers in commission, the third and fourth groups. Including ten reseals, made prod speed, the "Jouers' exceeding her contexes upon by a versaging 329 on a two hour's run. All of these losts are oil burners. The "Besle" scored 100 piec cost in a smoke test trial, running four hours who absolutely no moke showing at the smokestacks.

The Largest Drydeck.—The Canadian government is about to build on the St. Lawrence, near Levis, Gubes, a drydock which will be the largest in existence. Its dimensions will be as follows: Langth, 1,160 feet; width of entreane, 120 feet; depth of ell as ordinary high water, 40 feet. It will be divided into two sections of 600 and 500 feet. The outer entrease will be closed by a steel rolling oaisson, and the inner entreace by a

Seath Bosten Dyrdeck.—The Atlantic coast of America is shortly to have the advantage of at least two drydools capable of receiving the largest steamer. In addition to the one to be built near Quebee, another of about equal site is to be built as South Boston. The dook is to cost \$3,000,000, and a contract has been entered into by which the International Mercantile Marine, the Cunard, and the Hamburg-American lines will pay \$80,000 a year for twenty years for its use.

American Santiation in South Africa.—Oracle interest is fet by Americans in the visit of Col. Gorgas to South Africa to study conditions at the Consolidated Mines of the Rand at Johannseburg. The mining coffipanies have requested Col. Gorgas and Major Noble, both of the Medical Corps of the United States Army, to make investigations and recommendations regarding the sessitation of this mining district, where about 200,000 men are omnloved.

Rapid Increase in Dreadmoughts.—In view of the fact that only eight years have peaded since Britain laid down her first freedmought, it will surprise many of the naval enthusiants to know that, by the end of this year, the approximate number of dreadmoughts in the world, built or building, will be one hundred and fifty. The rate of increase, as given by an expert writer in the Sph rs, is as follows: One in 1905, nine in 1904, but years of the surprise in 1907, thirty-two in 1908, first-two in 1908, first-two in 1908, first-two in 1909, first two in 1908, first two in 1908, first two in 1908, first-two in 1908, first-two in 1909, first-two in 1909, first-two in 1908, first two in 1908, and 1909, in 1918.

Profits from the New Daal Subway.—Under the new operating contract with the city, the carnings of all the Brooklyn elevated lines and the Center Street loop are pooled. From the gross carnings, the company deuter rentals, taxes, operating expenses, depreciation, and a certain amount paid the company in lieu of the profit it derived from its existing lines when the contract was made with the city. After these deductions, the surplus is devoted to interest and sinking fund charges upon the city's investment. For the first month of operation of the Center Street loop under the contract arrangement, there was a balance in favor of the city of \$22,-\$70.09, which was more than enough to pay the interest on the city's investment and within \$2,814.52 of the sinking fund as well.

British Battisship as a Target.—The battleship "Empress of India," which was built at about the same time as our "Oregon," 'India," and 'India," which was built at about the same time as our "Oregon," 'India," and 'India, 'India,

Strength of Steel Cars.—The report of the Committee on Car Construction, presented at the annual moeting of the Master Car Buildew's Association at Atlantis City, recommends that entiting steel or steel-underframe care which have less than a certain strength must be classified with wooden care, and be subjected to the same relief for combination defents. The standard of strength should be as follows: 1, Area of center sill should be not less than 18 equare hockes. 2. The ratio of streng the should be not less than 18 equare hockes. 2. The ratio of streng the should be not less than 18 equare hockes. 2. The ratio of streng tender of the should be not less than 18 equare hockes. 3. The parts of members of the should be not less than 20,00. 3. The length of entire or depth of the members, pressured in the direction let which buckling might take place. For new cars the area of enters sill should be not less than 26-square families; this insteed of street to end signal not more than 0.00, and the length of center or death oil members or species of members.

WHAT IN WAY

#### Reismo

A New Seurce of Guana is the coast of French Somaliland. The guano is shipped to Europe through the port of Jibuti, and is said to be of high quality.

Payer's Expedition to Frans Josef Land, which sailed from France August 10th, has not, according to the Geographische Enterhift, attempted to proceed directly to its objective point, but is to winter at Vardo, Norway, and proceed northward carly next summer.

Prince Galitain, the well-known seismologist, has been appointed director of the National Physical Observatory at St. Petersburg—i.e., director of the meteorological service of the Russian Empire—succeeding Gen. Rykatcheff, retired.

Cooses is the name of a French product manufactured from copra, probably with the addition of small quantities of other substances, which is guining great popularity among Mohammelane and Hindus for use as a butter. Its peculiar resonmendation, as compared with other butter substitutes, is that it contains no trace of long fat or best faultow, and hence does no violence to religious

American Gineses, the market for which is almost containively confined to China and Korea, has been an article of export from this country for more than a century, the price stising, as the wild supply duminabled because of the clearing away of suitable forests, from 40 cents a pound in the early years of its collection to more than 86 a pound for the best qualities during the last eight years. The outlivision of the plant is comparatively recent; it began in an experimental way about 15 years ago, and has more attained such proportions that the output of the cultivated roots almost equals that of the wild. The total exports exceed a value of a million dollars a year.

value of a million dollars a year.

Award of Redgins Prise for Essay "On the Belation of Atmospheric Att to Tuberculosts."—On the recommendation of the Committee on the Award of the Hodgrins Prise of \$1,500 for the best treatise "On the Relation of Atmospheric Air to Tuberculosis," which was offered by the Satishensian Institution in connection with the International Congress on Tuberculosis, badd in Washington in 1908, the Lustitution announces that the prine has been equally divided between Dr. Ouy Hinsdale of Hot Springs, Was, for his paper on "Tuberculosat in Relation to Atmospheric Air," and Dr. S. Adolphus Knopf of New York city, for his treatise "On the Relation of Atmospheric Air," and Dr. S. Adolphus Relation of Atmospheric Air to Tuberculosas.

Pure Atmosphere in Industrial Work Rooms.—It is a favorable sign of our time that there is an increasing tendency among manufacturers to install equipment to raise the saultary standards in the working rooms of factories. Industries in which various forms of dust are seatlered through the atmosphere of the working rooms exparticularly in need of attention in this respect, and the matter is especially grave if the material floating in the open air is of poisonous character. How the problem has been solved in the white lead plant of the National Lead Company was described in the issue of our SUPLEMEARY for July 19th. A special system of wullking and overed hoods protects the workman from the injurious effects of the lead dust which would otherwise contaminate the atmosphere.

Capt. Sedov's Russian North Pelar Expedition, concerning the fate of which much anxiety had been felt since the autumn of 1912, when the least definite news of it was received, is now reported to be safe, for the time being, in the Panerstius Islands, just of the northwest coast of Nova Zembla. This information was brought by several members of the expedition, who were recently compelled by ill-health to return to Russia. The control of the control of

#### Automobile

Folding the Automobile Top Into a Covered Receptacle.—Patentt No 1,071,348 to Ruchard H. Rice of Lynn, Mass, provates an automobile body with a receptacle in rear of the back seat, whose cover can be opened to permit the top of the automobile to be collapsed into the receptacle and then closed to enclose the top.

An Automobile Journey Across Africa, from south to north, has been undertaken by an Englah officer, Lieut. Kelsey, who started from Cape Town August 17th, and hoped to reach Alexandria, Expyl, in 120 days. The first crossing of Africa by automobile from east to west—viz., from German East Africa to German Southwest Africa—was accomplished by a German, Lieut. Gractz, as recorded a few months ago in these columns.

The Peer Man's Automobile.—England is said to have more than a hundred cycle oar factores and it is no casage-ration to predict that America will soon you will beginn the production of the charge automobile. One manufacturer, however, has goon in for the production of a snall cas which is decededly not a cycle car, but a regulation automobile with full width tread, change gear transmission, four cylinder motor and full width seat. This little ear, which will sell for less than \$500, has a 90 inch wheel base and a \$24.8 inch mutor developing about 22 horse-power Under tests on the road the ear has gained a speed of 52 miles per hour.

Petroleum Society Incorporated.—With the object in view of benediting and uniting many unrelated interests that depend to a certain extent upon the production of petroleum, the American Petroleum Society has been organized at Pittaburgh, Pa., and incorporated under the laws of that State. It is intended to make a thorough study of petroleum technology, to certailate the information gausel thereby and to conserve the petroleum resources of America. That much promise for relief from the present fuel situation in the automobile field is hoped for, is shown by the fact that the Society of Automobile Engineers, the American Automobile Engineers, the American Automobile Engineers, the Society of Mechanical Engineers, the Society for Testing Materials, and several others sent delegates to the recent conference.

As Ambulance Rospital—The Queen of Bulgaria, who takes a great interest in the Red Cross service, has had bulk as precial ambulance automobile at a German works, and it was used in the field during the war in the Bulkans. The roomy body of the limousine type is arranged in two compartments, one on each side. On the right hand side are lodged two stretchers one above the other which can be run in by means of rollers through a back door. The other ach has two seats for the aids and is also resched from the back, there being also two side doors. As the said door in the stretcher compariment can only be opened from the outside, it is impossible for patients to leave the ambulance unawares. Ground glass passes give sufficient light while preventing the interior from the outside. Dr Paul Frank, a prominent Berlin insciend official, designed the Dresent ambulance.

French Official Tests of Motor Trucks.—What will rank as the greatest mitor voluels content in the history of motordom has just closed in France, after more than a hundred whiches had been subpeted to an official test by the French War Office, over a period lasting forty days. The trucks began July 1st and ended August 9th. They were participated in by minety-eight manifecturers, most of whom entered more than one undel. The trucks are tractors hading one or more trailers. The former were required to cover 1,085 miles and the latter 1,106 miles in mineton days over a circuitous route, operating on gasoline, benzine or alcohol without changing carburoters. The purchaser of any truck which has successfully mot the required conditions is granted a subsidy by the French government, with the agreement that the truck is always to be at the service of the War Department in case of emergency.

Automobile Roads in Egypt.—To the activity of Lord Ribohner is due the construction of a fine automobile route in Egypt between Carro and Alexandria. The road is some 130 miles long and was practically finished some time ago. Although some of the intervening cities are already connected by roads, this is the only through route between those two cities, so that it will be much appreciated. It now appears that the Public Works Department is engaged on plans for a complete network of nain routes to cover the whole of Egypt, and those will be in charge of the government while the secondary roads belong to local authorities. Outside of military use, the plan will be of great economic value to the country in opening up innecessible districts. In other cases it will add to the facilities given by the Nie and by railroads, both for commerce and for touring. According to this, the day is not far distant when an automobile one make the trip from the port of Alexandria clear to the first extraction or a 6010 and in contributions of 6000.

## The Khedive's State Train

## A Benzol-Electric Train for the Governor of Egypt

By F. C. Coleman

T WO motor coaches (a saloon coach and a composite coach for the suite and attendants), each equipped with a bearol-electric set, have recently been supplied to serve as a state train for the Kbedier of Egypt The system of driving adopted differs

The system of dirichig adopted differs from previous forms in the fact that each of the two coaches is equipped with a combustion oughte, dynamo and electric motors, and the train can be controlled from either of the drivers' compariments at each end. The division of the machinery between the coaches possesses the following advantages: A better distribution of the weight is secured. When reversing the direction of travel, the pushing of the front coach by the rear coach is avoided; and it also becomes unnecessary to shunt the coaches. If a defect occurs in one of the combustion oughness or electrical machines, the train can be propelled at a reduced speed by the set which remains intext. The train is intended to travel at a speed of 40 niles per hour on the level, and the total train weight without passespers is approximately 100 tous.

The construction of the train is illustrated herewith Each casch is mounted on two two-sale trucks. The beauso-deective sets are mounted in the two trucks ranning at each end of the train, the four electric motors being placed in the center bogte trucks. The combustion engines are fixed to a special inner frame which is supported from the axles is supported from the axles is supported from the axles is supported from the ordinary double spring suspension of the coach body from the axles, a triple spring anspension is obtained be tween the coach body and motor, thus oliminating all vibration. The custine trucks are placed so far in front of the coaches that the engines and auxiliary machinery are completely exposed when the bounces are removed, the electrical matchines are accessed in through openings on the roof flower realistors are mounted on the roof accessed that councering place to the council of the council of the excession of the excessi

The setion coach conteins one large reception should and a private setion, both of which are luxuriously fitted up. It also contains a favatory, observation plat form and driver's compartment. The composite coach contains two second class compartments, three third class compartments, the contains two second class compartments, a leavatory and a corridor leading through the whole coach to the driver's compartment. In leavatory and a corridor leading through the whole coach to the driver's compartment. The two coaches have a vestibule connection with each other

Each machine set consists of a combustion engine with its maxiliaries, and the electric generator and exciter, the latter machines being coupled to the motor by a floxible teather belt coupling. The fourcylinder combustion engine has a continuous output of 12th horse-power at a speed of 700 revolutions per minute. It will operate either with lenzed or goodine. The valves are all situated on one side and are actuated by a common shaft. The engine is started by means of compressed air from an air tank. The cooling of the engine is effected by water circulated through a honey-comb radiator, mounted on the roof of the coacis, and in addition to the natural draft when traveling it is cooled by an electrically driven fan with a vertical slatt mounted on the coach

roof. The fase tank is suspended from the engine truck and the fuel is kept under the pressure of a neutral gas, nitrogen or carbonic seld, which is drawn from a steel cylinder through a pressure reducing device. This arrangement insures absolute immunity from explosion. The speed is regulated by a centrifugat governor. The regulator has a speed adjusting device operated electricatly from affe controller in the "out" position, by means of which the speed of the combustion engine can be reduced to approximately one third, when the

coach is stationary. By these means the noise caused by the motors when the train is not moving is appreciably reduced and, moreover, there is a considerable saving of fuel. The exhaust gases are led over the roof into

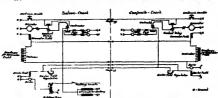


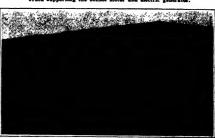
Diagram showing the system of electric connections.



Benzol-electric train built for the Khedive of Egypt.



Truck supporting the benzol motor and electric generator.



Driving truck fitted with two motors.

the open air through a stlencer suspended in the chimney by springs and facibly connected with the motor. The generator in each machine set has an hourly rating of 80 kilowatts and a continuous rating of 80 kilowatts, the exciter having a continuous rating of 85 kilowatts. Both machines are cooled by a fan mounted on the same sheft. The normal generator pressure is 300 volts, the exciter pressure sheing 60 volts. The generator has auxiliary poles and can be overloaded at starting with a current up to 800 nupsers. Each coach

is equipped with two series wound auxiliary pais motors, each having an hourly rating of 30 holes-power at 300 volts. The motors work the axies through granted having a ratio of 1 to 2.6. The control is effected by

regulating the voltage of the ators. The control of both as may be carried out in essetther of the drivers' on The system of connection is sh drawing. The met or circuits other, and the generator of one : feeds the two motors of the si so that heavy cable couplings are not required. There are the necessary safety precaution, such as fuses, overload release, and arrangements for breaking the di-cuit on releasing a push button on the concuit on recessing a push outron on the con-troller. The reversers operated from the master controller are placed in each coach for reversing the direction of travel. In the field circuit, the one exciter excites the two generator fields connected in parallel, through a common resistance the steps of which are gradually shorted cutted by the controller at starting, may be seen from the diagram, one these resistances is placed in ea i.e., one for each controller, so that only one of them is in use for each direction. The two exciter fields connected in arallel are fed in a similar manner from an auxiliary battery with a one hour capacity of 68 ampere hours at 66 volts, to which the second exciter is connected in to which the second exerter is connected a parallel. When the combustion engine is running at a low speed this exciter will be switched out automatically by a special switch, and when the speed is high it is awitched in again, so that in the first case battery works alone, and in the and case it works in parallel with the exciter, and can also be charged from the latter while the train is running. The lighting, signaling apparatus (consisting of a motor siren and gong) the battery ignition and other auxiliary apparatus are nnected to the battery.

The operation of the controlling near is as simple as in the case of a single coach, after the two bennol cuttines have been started up and the constant cretter voltage adjusted. Should any part of the equipment develop a defect, the system of connections can be attered in such a manner that the train will operate with the equipment of the other coach alone, this alteration being effected by means of a throw-over switch, which is sealed in its normal position.

Subsoil water has been a somewhat newlected factor in agriculture, yet it is the theory capital upon which the secons of the crops depends in a dry easen, as well as the source of brocks and rivers. Dr. W. J. Moles of the United States Burseau of Soils has just published a monegraph containing Share strikes starting facts bessel and the state of the United States; i.e. a well ceases of the United States; i.e. a starting relating to the state of the United States; i.e. a starting relating to the United States; i.e. a starting relating to the United States; i.e. at a strike relating the second of water within the sire hundred duct from the revulled surface in sentiment duct from the cround surface in sentiment of the country, sense 17 feet deep; i.e. as a smooth eight when to for 7 years' raisall of come 30 years' dicharays of all the stress of the occurry of

is estimated as sufficient to form a neservoir constructions with the country seems
17 feet deep; i. e. an amount enginement
to 6 or 7 years' rainfail of some 50 years'
discharge of all the civers of the country.
In order to be or use in agriculture (see
out as draw upon in artificial irrigations) the upper
level of this unbierranean ocean must be within each
lary reach of the surbers cold. The stimeters almost as
to find that this level is standily whithin over the
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Plate L.—Showing typical conditions along the edge of the Sun. From a photograph made with a spectroheliograph using the light of calcium.

## The Profile of the Sun

## How Invisible Solar Prominences are Studied by Means of the Spectroheliograph

By Frederick Slocum of Yerkes Observatory

I F the sun is seen through fog or dust, or is observed through a smoked glass, its outline appears to be perfectly smooth and sharp. One would little suspect that its profile is really characterized by such fantastic shapes as are shown in the accompaning liberations, which are from photographs by the author, made in the light of calcium with the Rumirord spectrohelio-graph of the 2frase Observatory.

Plate I shows typical conditions along the edge of rate I shows types i conducts along the edge or the sun. The general raged outline is the surface of the chromosphere. The larger forms are called solar prominences or protuberances. Plate II illustrates different types of solar promi-

Fig. 1 is a gaseous cloud resembling the appearance of a grow of baryan trees, rising to a height of 42,000 sulles, and extending along the edge of the sun for a distance of 240,000 miles. Prominences of this type may perist for weeks or even months. This particular one was observed for 55 days.

Fig. 2 shows a group of prominences in the vicinity of a sun-spot. The streams of matter from both sides are pouring directly down into a aun-spot, which was very near the edge on that day. The arc of the sun shown in the picture represents a length of 300,000 miles, which will give some idea of the distance to which the attractive induces of a spot may extend. Fig. 3 is a collection of arches and streamers, shown

in fine detail. Its height is 63,000 miles.

Fig. 4 resembles somewhat a turker standing 67,000 miles high. Another photograph taken two hours later shows what looks like a cloud of feathers floating off

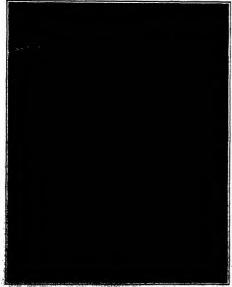
into space.

Figs. 5 and 6 are two photographs of the same prominence separated by an interval of 43 minutes. Within this time the prominence increased in height from 72,000 to 150,000 miles, corresponding to a movement s a second. Such rapid transformations are characteristic of the so-called eruptive type of promi-

Figs. 7 and 8 show the changes that took place in another prominence within 24 hours. Among other things, it may be noticed that the wind has apparently changed its direction. In fact, from prominences of this type some idea may be obtained of the general circulation of the solar atmosphere.

The existence of these prominences around the edge

of the sun was first detected during total cellpses of the sun. When the moon passes directly in front of the sun and has cut off all of its light just up to the very edge, these forms may be seen projecting out beyond the edge, shining brilliantly with a rose-colored beyond the edge, shining brilliantly with a ross-colored light. The only reason that prominences cannot be observed at any time by simply holding up a screen to cut off the direct light of the sun is that our atmo-sphere refracts and reflects the light of the sun, making the sky brighter than the proudsneces themselves. To an observer on the moon, which is devoid of atmosphere, the prominences, and even the stars by day, would appear against a black background of sky.



AND MARKET STATE OF THE PARTY O



Plate III.—The Rumford spectroheliograph attached to the great telescope of the Terkos observatory. The apparatus used for photographing solar promi-

In 1868 Janusen and Lockyer discovered a method of reducing the giare of the sky without, at the same time, reducing the light of the prominences, thus ren-dering it possible to observe these solar appendages at any time, and not merely during the few minutes of

It had been noted that the prominences gave a dis continuous or bright light spectrum. That is, if viewed through a spectroscope, a prominence would present several images of different colors, red, yellow, blue, etc., due to the light of hydrogen, helium and calcium chief constituent elements of the prominences. These images would be separated by appreciable intervals. If greater dispersion were used, that is, if a second were added, or a grating introduced, the dis tances between the various images would be increased, but their brightness would not be sensibly affected. The light of the sky, on the other hand, gives an

entirely different type of spectrum. It consists of fine lines projected against a continuous bright spec-If the dispersion is increased the total light is trum. If the dispersion is increased the total light is spread out over a greater area, and, therefore, the brightness of any one part is reduced. Moreover, the skylight gives dark lines exactly where the prominence gives bright lines. Thus, by using a spectroscope of sufficiently high dispersion, it is possible to see the prominences projected against a relatively dark back ground.

all ordinary purposes the slit of a spe scape is made very narrow, in order that the spectral scape is made very narrow, in order that the spectral lines may be fine and sharp, but for this purpose the slit may be open somewhat so that the whole of a small pruminence, or a considerable portion of a large promi-nence, may be seen within the opening. It widened to much, the background becomes too bright, so, in the case of large prominences, it is necessary to study them in sections. For such observations the slit of the spece is placed tangentially to the sun's edge,

by rotating the spectroscope through 800 degrees, the whole circumference may be examined
Ever since this method of observing prominences was discovered, daily observations of the sun's edge have been made in various places. In Italy a society was formed for this expressed purpose. Their publications Memoric della Società degli Spettroscopisti Italiani contain a practically continuous record of prominences for the past forty years. The published records are free hand sketches of the profile of the sun, showing the location and approximate form of all prominence for each day, and detailed drawings of those that were unusually large or active, to show the changes in form and size. At the same time, important but iess sy tematic work of the same nature was being done in England, Austria, Germany and the United States From these visual observations, two distinct types

of prominences were distinguished, the quiescent and of problements.

the eruptive These were observed to differ, not only in shape and activity, but also in composition and distribution. The quiescent prominences generally assume the composition of the co sume forms resembling clouds, or trees, or groups of trees, in size they vary greatly. Some attain the enormous height of several hundred thousand miles while others are even less than a thousand. In interal extent there is a corresponding difference. Some cover fifty degrees or more of the sun's circumference, while others may be confined within the limits of a single In this type of prominences, as the name im the changes are comparatively slow, and yet at times there are remarkable exceptions to this rule A prominence, which has remained quiescent for several days, may suddenly undergo some internal up heaval or explosion and be completely annihilated in a few minutes. The spectra of these prominences show that they are composed almost exclusively of hydrogen helium and calcium. They are found in all latitudes but a careful tabulation of the observations of many years shows principal maxima between 20 degrees and 25 degrees latitude in both hemispheres, corresponding with the positions of maximum sun-spot fre-The eleven-year period, manifested by sunspots, is also shown, but to a less marked degree, by the quiescent prominences

The eruptive type of promineness, on the other hand, closely associated with som-spots. They are rarely found beyond the limits of the sun-spot zones and they follow almost exactly the periodic and they rotion amost extertly the personal response, of sun-spots. They contain not only the hydrogen, helium and calcium of the quiescent type, but also frequently low, magnesium, titunium, hardum, sodium and namy other substances, chiefly marks. The crupic prominences supear as else, rockets, foundains, etc. They are generated property of the pr lu a few miunter

In 1891 dawned a new era in the study of promi nences, when Prof. Itale discovered a method of photographing them As in the case of visual observations, a spectroscope is used for this purpose, but when adapted to this special work it has been called by Prof. Hale a spectrobeliograph. It differs from an ordinary

spectroscope by having a slit in the focus of the camera, in addition to the ordinary slit in the focus of the collimator. The function of the second slit is to isolate any particular line of the spectrum, and enable the observer to make a photograph in the light of a single element. Thus, since prominences are composed chiefly of calcium, hydrogen and helium, it is possible to make a photograph of them in the light of any one of these elements. The H and K lines of calcium and the C line of hydrogen are best adapted to this purpose. The process consists of moving the image of the sun over the first silt, and at the same time, and at the same the first silt, and at the same time, and at the same rate, moving the photographic piate across the second silt. The same result may be accomplished by keeping the image of the sun and the plate fixed and moving the silts. When photographing the profile of the sun, a metal disk is so placed as to cut off all light of the sun except that which comes from the very edge. This method was used in taking the photographs

from which the accompanying illustrations were ma the great telescope of the Yerkes Obs

#### The Naval Airship By Carl Dienstbach

A FTER aircraft had shown their efficacy as scouts for the army even under the test of actual war, the navies of the world immediately took steps to use But while the soldier had done much in the ling the early toy aeroplanes into practical—albeit risky—machines, the sailor demanded an entirely novel sort of aircraft. Naval aeroplanes, because of the largeness of a naval theater of war, resulting from the fast movements of fleets, as compared to armies, and depende on the shore, are of limited usefulness in escorting a feet. An acrial vessel must leave shores far behind and cruise for days over the high seas. Only the mam-moth dirigible, a type, the development of which would probably have been delayed by the enormous expen of experimenting, held out any promise of fulfilling such demands.

Germany is the one nation which has thus far built navai dirigibles worthy of the name. Two appailing disasters have shown how thoray is the path she had entered. But while the first seagoing dirigible of Ger-many, a 22,000 cubic meter craft, the largest the Zeppelin factory, nated as the only entirely successful constructors of sizes above 14,000 cubic meters, would under take to build so late as a year ago, proved too small to withstand a real storm at sea (harder to avoid than on iand in the aissence of maritime weather stations), and while its more promising successor of 27,000 cubic meters fell victim to a totally unexpected internal catastrophe at the very outset of its career, there is no relaxing in Germany's efforts to make a dirigible practically the equal of a stemmer. This attitude, in the face of losses in officers of the highest efficiency equivalent to the cosmulties of a small battle is more easily understood, if the inducements these experiments out, are analyzed.

At sea aerial scouting assu mes an importance barely foreshadowed by the less that has been done on land. Owing to the level, uniform background it is impossible. sharing fog or heavy rain, not to see a vessel from shave at the remotest parts of the immense circle which extends to all sides for sixty-five miles even from the moderate height of 3,000 feet. It is easy to distin a warship from a merchantman, no matter how dimly The characteristics are too pronounced. It is als fairly easy to recognize men-of-war of different nationnairy easy to recognize mea-or-war of directin national stitles in that respect the United States have been most obliging to sirehips in adopting "maval landmarks" like finating Effect towers. But the difference between Engthst tripods and German "castle towers" for mill-tary masts is also marked Impressive, too, are the French smokewisches but it is often sufficient to recognize vessels as fighting craft by the way the smoke drifts from a fleet, and then to call for the which countersign. Radio-telegraphy has led to ludicro countersign. Maniference and Turkish armorelads in action exchanged wireless epithets, quite as the heroes of Homer roundly swore at each other in

Less unusual events may happen if a naval airship sights suspicious vessels from afar and an enemy tries to pose as a neutral before the aerial cross-examiner

to how me in neutral nervor the acreal cross-examiner.

It is worth noting how much neutral war vessels may now influence the issue by their mere presente upon the seene. This may lead to new international regulations, such as secret countersigns for neutrals, etc. (On tions, such as secret countersigns for neutrals, etc. (or hand the presence of neutral forces on a battlefield is obviously impossible.) It is not unlikely that a neutral who has posed as an enemy might be treated as an enemy. All this will be more clearly understood if we recall the more familiar conditions of serial secution recan the more raminar conditions or aertal security, over land, and ask: How would an army be treated who, without taking part in the fighting, would never theless decide the outcome by poshing for the airsoquits in this aertal age neutral forces play involuntarily the

20

part of the "neutral" Appearance on the Francisco, stde under Fraderick the Gessel. The second important point, which, makes mayed are structing so superior to military alreasesting depends, or the mobility of faceto compared with coldiers. The pe-tertial possibilities of an enduring, stouch several velocicounty possessions on a supermay, stated serial velocity of attri-free miles an hour, monthing stong and relability wireless equipment that covers sees 400 miles, are staggering. That is the craft which England really has to fear. Its mere existence is equal to doubling and trabiling a foreign navy. Without such "eyes," the English ing a rowing may, without such "gree," me anguar facet will either grope in the dark as a whole, or, being scattered to protect the shores, it will be defeated in detail by superior numbers. It will eath only an occa-sional glimpse of a foreign airship far away. But the emy's fleet will be two hundred miles farther away and always remain at that distance white safely convoying a numerous fleet of swift giant ocean liners crammed with soldiers to the "impregnable" shore. It is a very simple same of blind man's buff. Aeroplanes are not equal to this strategy. A condition sine que non, eventually, will be that aircraft can not only "craise" over water for several days, but have also enough lift-ing power or size to carry the ponderous gyroscopic ing power or size to carry the posserous groscopic compass and magnetic instruments with which to ascertain their locality, and consequently that of the enemy's fleet at all times and under any conditions. A good battery of long range automatic guns and machine rifles for aerophane defense will also be required.

In this respect and others it might be pointed out

that under modern conditions Britain's real danger has probably shifted from the Channel to Scotland, and that not the near, but the far foreign bases. which permit of an unobserved initial movement and a wide scope of action of the enemy's fleet, are now the a wine scope of action or the enemy sines, are now the formidable ones. Will this lead to many drownings of English aviators attempting to cross the German Ocean to Denmark and back without landing and to a pernauent "peaceful" blockade of the German bases by the whole English navy? Need Germany submit to such a blockade just outside its home waters? Germany in turn is handleapped by the conwaters: Germany in turn is minimizence by the com-fined nature of the watera near its bases; but its own navy might be cruising in the open, protected by aerial eyes, before the beginning of hestilities. To start transports in safety would be more difficult, but a fleet of swift transports might also manage to cruise early in the open under aerial protection. They could rendezvous from anywhere, the airships "herding" them by wireless. The whole coast from Emden to the Danish border would furnish suitable points for a steathly embarkation, with the help of strategical rail-roads. Once out of the North Sea the whole force would be absolutely safe as long as the airships held out. And there is no reason why a dirigible might not take aboard supplies from a ven el at s

#### Waste From Desks Goes Into Brushes

WASTE wood in the manufacture of school desks is now being used for the backs of cheap brushes, ording to the statement of the forest service.

A large manufacturer of school desks in Michigan had a considerable amount of waste material in sizes which were too short to enter into the manufacture of the smallest desks, and could not be utilized further with his machinery or in his line of work. This material was all hard maple in pieces an inch thick, a foot or so long, and about three inches wide; for a long time it had been consigned to the waste pile and sold as firewood. This waste amounted to from one thouas interesting the waste amounted to from one most sand to fifteen hundred board feet each day. A nearby manufacturer was using practically this quantity of maple, which he was sawing up into small pieces for making the backs of chesp brushes.

Members of the forest service, investigating methods of eliminating factory waste, conceived the idea that the blocks used by the brush factory could be readily secured from the waste of the school desk mannfac-turer, and on this basis got the two together. Arrangesuis were made so that the brush manufacturer new sees orders with the other firm for its raw material and what was formerly waste is now a sor

#### Moving Picture Records of the Balkan War

WAT

NE of the good uses for moving picture films is for recording historic events. Not long age the King of Roumania organization the production of a film of no less than \$0.00 yards length, this being a respondention of the Roumanian Russo-Crutician war which determined the independence of that country. The film will then be kept in the scribt each time of the real in In order to carry this out, the army lent \$0.00 men in uniform with arms and baggage, led by the efficient. Another case is that of the Italian government, which is actiseding all the films taken during the war in Tytpoil. In England the same is done for the films of the King's coronation events.

## Correspondence

The editors are not responsible for stateme do in the operapositions column. Assumment of ministrus, comes to considered, but the names respondently will be untilheld subon to desired.]

# A Plea for Careful Maintenance of Aeroplanes

the Editor of the Somerific American: The recent and fatality to Max T. Lille, the Chicago

aviator, at Galesburg, III., prompts me to present a few facts to the general public pertaining to the accident. That the accident was not caused by motor stoppas, and not due to suddee guest, is not generally known among lagmen, who have learned the details only from the none too accurate press. It is only the real student of aeronauties who, after investigati facts of the deplorable tragedy and its real bearing

The striking feature to be considered is, that the ac it was entirely avoidable! A report preceded by the investigation by Grover C. Loening, engineer of the Wright Company, states that the co se was old, weather beaten, and rotten. Many n sary parts had been forgotten or neglectfully omitte in the setting up of the plane, and many of the vital steel parts were rusted so that loose-play joints were bound. The wings were old and the cloth had rotted until it was a mere rag, torn at the slightest provocation. The spars were rotten in many places and abo-lutely unfit to undergo bending stress, having egitrely no pretense at strength. Is it to be wondered that the stress of a steep bank or a sudden dip should wre a machine, neglected as this one was, asunder?

Naturally, aviation as a science is the innocent suf-ferer of this preventable accident, both in the loss of one of its best loved and foremost airmen and in the prejudice of the criticising public. The lesson of thi tragedy is a pies for "greater care." If a steel part becomes rusty, it should be replaced. If the varnish is scraped from a spar, its needs should be attended to at once. Do not wait for an accident, perhaps fatal, to accentuate the faults of the machine! Discover the weak points and remedy them accordingly. Overc dence in his machine has been the Waterloo of many an airman. By the adoption of "greater care" many accidents can be avoided, and aviation will profit there EVERETT P. GORDON.

#### The Velocity of Hertzian Waves

To the Editor of the SCHNTIFIC AMERICAN :

In your issue of August 2nd I read with interest of the proposed co-operation between the wireless stations at the Eiffel Tower and at Arlington to determine the velocity of the Hertzian waves. The writer expresses a doubt, which seems to me well founded, as to the possibility of devising means to "flash back" the waves across the Atlantic in order to measure their rate of

It seems to me, however, that other means could be ed which would accomplish the same end with cailing for apparatus of such prodigious nicety of adcalling for apparatus or such productions interly or ac-justment as that suggested. Would it not be perfectly practicable to proceed as follows: Let the wireless transmitters at Washington and at Paris be coupled as usual to the clocks so as to send out instantaneous sigusual to the cross so as to send out mannianeous main each second, only let the clock at Paris beat seconds one tenth of a second or so behind that at Wahington. If now a recording apparatus with revolving drum be installed at each station, the two ticks could be compared on the same sheet, at each end. It would of course be necessary to protect the receivers from the direct action of the nearby sending tation, but that could readily be done by automatically switching of part or all of the antenna, and shielding what remained.

part or an of the societies, and smearing wint remained.

The record made on the revolving drum at Paris
would show two ticks approximately one tenth of a
second apart. But the lead of the Washington tick
would be diminished by the length of time it took for the waves to cross the ocean; while at Washington the lag of the Paris tick would be increased by the same amount. Thus, if the ticks for any given second were compared on the two records, there would always be a difference equal to twice the time required for ne a currecture equal to two the time required for the waves to cross the intervening space. As any ir-regularities of the clocks would affect both recorders allke, it is evident that this difference would be inde-pendent of all instrumental errors, unless there were a

pendent of all instrumental errors, nuless there were a difference in the "reaction time" of the two recorders. It would seem a rather simple caster, by interchange of instruments, to eliminate this error also. The same process repeated over land somewhere would rigid valuable information as to the effect of land and water on the waves. The distance measured could satisf be reduced, if a dram revolving several theorems or even a few hundred times per second be indust. Smallish. deed Smallie. American Mission, Harpoot, Turker.

Single grove to be

#### Indian Summer at Home and Abroad

THE English meteorologist Abercromby introduced into the science of weather the important generalisation of "recurrence," under which term he brought together the numerous instances of the supposed tend-ency of certain types of weather to occur about the same time from year to year, independently of, and often in marked contrast to, the regular march of the ons. Thus in western Europe a period of unsea sonable cold is found to occur very frequently about May 9th to 14th; whence the days dedicated to Saluts ertus, Pancratius and Servatius, May 11th, 12th, and 18th, are known in France and Germany as the "ice saints." In England a similar period occurring traditionally in the second week of April is called "blackthorn winter," while in America we have a "dogwood winter" some time in May—"when the dogwood is in bloom"—and it is a common belief that the snowball ns bring cool weather with them to justify their

In England rains are looked for about Augu to Sth. These are the "Lammas floods." New England has its "January thaw." Both the Old and New World cling firmly to the tradition of an "equinoctial

The most famous case of recurrence, however, is the idian summer—so called in America, but in Europe reindian simmer—so called in America, but in surope re-plocing in a score or more of other names. It is "all-hallow'n summer," "old women's summer," "go-sum-mer," "All Saints' summer"—collectively—and well-nigh all the saints' summer individually, since in variiands it is linked with the names of Saints Luke, Martin, Michael, Bridget, Teresa, Wenceslaus, and so on, through half the autumnal calendar. The terminology is curiously confused with that of the spiderwebs that float in the air in mild autumn weatherwebs that float in the air in mild abrumn weather—
"gossamer," "go-summer," "gose-summer;" in German,
"Altweibersommer," which means both the webs and
the season of their occurrence, the two things being woven into the same fabric of folk-traditions.

The various cases of "recurrence" have been the sub ject of numerous investigations on the part of meteor-In Europe most attention has been paid to the slieged cold period in May-the "ice saints." the ningrest coun period in May—the "fee saints." Many long weather records seem to show that a cold spell does commonly occur in the middle of May, and it has been explained as follows: With the approach of summer the land warms much faster than the ocean, conmer the and warms much taster than in even, countries the thing of the taster relatively hot, the air above it rises, reducing the barometric pressure, while relatively high pressure prevails over the cold ocean northwest of the British Isles. The surface winds then flow from the cold anti-cyclone toward the cyclone; in other from the cold anti-cyclone toward the cyclone; in other words, cool northwest winds prevail over western Europe. A more searching study of the temperature records, however, has in necessity sears tended to dis-credit the existence of any well-defined cool period limited to particular days, or even weeks. It is evi-dent that the belief in the "iew saints" having once taken root in the popular mind, the occurrence of a cool spell at aimost any time in the spring would be readily accepted by unscientific people as confirming the phe nomenon as one of regular recurrence; just as almos any autumnat storm is popularly identified as the without much regard to the actual date of the equinox. Iconoclastic science long ago demolished legend of "the" equinoctial storm. So far as east ern North America is concerned, the autumnal equinox falls within the period in which West Indian hurricanes are likely to sween up the Atlantic seaboard. If the public chooses to call one of these tempests an "equi-noctial," it is entirely at liberty to do so; the name being neither more nor less appropriate than that of "Easter Illy" for a plant that blooms in the early and middle spring, but by no means exclusively on Easter

"Indian summer" in America is quite as elastic a term as "equinoctial." As the name of a type of autumnal weather it has a pretty definite meaning. As implying the more or less regular recurrence of a par-ticular season, year after year, at approximately the same date, it is misleading. One often hears peo-say, of a few days of fine, crisp autumn weather. der whether this is Indian su mer?" To which an other may answer, "No, it can't be, because we haven't yet had 'aquaw winter.' " The idea so firmly rooted in yet had 'squaw winter." The idea so firmly rooted in the popular mind that each autumn, as a rule, there is one period of cold, cloudy weather—with perhaps a flurry of snow—followed by one period of mild, sunny, hary days, finds no confirmation in the pressive records of the meteorologists: Indian summer weather, in fact, casy any, noted no confirmation in the prossic records of the meteorologists: Indian summer weather, in fact, prevails intermitteently over a period of two or three months. Thorest, at Concord, Massachusetts, notes in his "Antuma" that during the ten years from 1851 to 1860 weather of this type occurred on September 27th, October 7th, 18th, 14th, 31st, November 1st, 7th, 8th, Tith, 33rd, 25th, December 7th, 10th, and 18th. The indefiniteness of the term is even more strikingly brought out in Schaeders's analysis of the westher records of Milwankse, in the Monthly Weather Review for

September, 1902. (The same journal for January and February, 1902, contains the fullest of all discussions of Indian summer from the philological rather than the meteorological point of view.)

The European equivalent of Indian summer is a triffe less indefinite. A painstaking memoir on this subject, from the pen of Dr. Artur Lehmann, has re-cently appeared in Germany. Dr. Lehmann gives us. in the first place, an elaborate account of the terminology of the "after-summer." the commonest name for which in German is Altweibersommer ("old women's summer") In a great many countries and districts this season is, as we have said above, traditionally associated with the day of a particular saint in the autumn called with the any of a particular saint in the aniumn calendar; thus implying a more definite time of occur-rence than does the term "ludian summer" Dr. Leb-mann gives the reputed dates for the beginning of the which vary considerably with latitude, thus Russia has a "young women's summer" as early as the latter part of August, while the "Estate di San Marof Italy begins November 11th The author also gives us many interesting particulars concerning the association of the "after-summer" senson with floating spider-webs, or gossamer; a theme of picture-sque

A careful analysis of meteorological records shows that the occurrence of the Indian summer type of weather is most frequent over central Europe in the 55th pentad of the year; i.e., September 28th to October 2nd. It is easily traceable to the presence of a widespread area of high barometric pressure over the at east of its center, bringing mild southeasterly winds to the region in question, and atsoutheasterly wholes to the section in question, and at-tended by clear skies and strong insolution during the day. These conditions may persist for only a few days, or, occasionally, as long as four weeks

We must infer, however, from the facts presented in Dr. Lehmanu's memoir, that, as in the case of our own Indiau summer, the "after-summer" weather of Europe may occur intermittently through the antumn: but that the particular period of such weather that h coincide with various autumusi activities of the rural population is the only one that attracts general attention. From a meteorological point of view, in Europe as in America, there are probably several "Indian summers" in some years, while occasionally a year may have none. In other words, "Indian summer" is merely a convenient designation for the most delightful of all types of autumn weather

#### First United States Patent on Ice Making

THE first United States patent for the manufa-THE first United states partial to John Gorrie of of Ice, No. 8,080, was granted to John Gorrie of New Orleans, La. on May 6th, 1851, for a process of artificial production of ice, and the original patent and re now on exhibition in the United States Na tional Museum

They are especially interesting in that they cover completely Dr Gorrie's early method of making ice and his refrigeration system, which was the indirect process, that is, the cooling of an uncongealable liquid which in turn cooled other substances. According to the early custom of the Patent Office, the papers and the patent are written by hand on parchment, and ough now quite old, are nevertheless in excellent con ditton

In 1898 Mr George H Whiteside of Apalachicola, Florida, secured these papers which he presented to the Southern Ice Exchange, and for that organization de-posited them in the National Museum, together with a series of articles on the same subject which appeared in the Commercial Advertiser of Apalachicola, Fla. in the year 1844, as written by Dr. John Gorrie under the nom de plume of Jenner.

## The Current Supplement

O NCE again the plan of connecting England with the European continent is being agriated, with more promise of actual execution than ever before account of the latest project is given in this week's Supplement — Some tractors for farm service, exhibited and tested at the recent Solssons competition, are illustrated and described.—Dr A Gradenwitz writes on the manufacture of porcelain—R S Whipple's paper on modern methods of temperature measurements is concluded in this issue -E. D. Clark writes on the origin and significance of starch -The elimination of cinders from furnace gases is an important industrial problem. How it has been successfully solved in a large plant is shown in an illustrated article -F. E. Kaem scribes dial scales for the rapid weighing of merchan-

There are fifty-five caks in the United States, about renly divided between the East and the West. The eastern species and particularly white oaks are the most

<sup>&</sup>quot;Altweibersommer; die Wärmerückfälle des Herbstes in Mitteleuropa," Thiel's Landscirischaftliche Jahrbücher, vol. 41, 1911, p. 57-129.

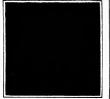


Fig. 1.—Microscope under beil glass, photographed with visible rays.

# Photography By Invisible Light

Things We Should See if Our Eyes Were Sensitive to Ultra-violet and Infra-red Rays

By Prof. R. W. Wood, Johns Hopkins University



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Fig. 2.—Same subject as in Fig. 1, photographed with ultra-violet rays.

Di RING the past two years I have made from time tent our knowledge of usture could be extended by making photographic observations of various phonoments on the limit of the

known for many correction to the known for many corrections have been most exhaustively investigated, but up to the time at which these experiments were commenced no attempts independent of the many continuity like the many continuity like the total state of oldpars, like for the study of objects. It is obvious that a great part of our knowledge comes from simple observation by the eye, unalded by any optical instruments, but the eye is an interest and instruments, but the eye is sensitive only to a narrow range of the spectrum, for some of the rays that reach us from the sun and from our surfilledal lights make no largeresion upon the human realms. Now, inasmuch as these invidule raws are reflected from all objects in precheely the same way as are the rays of visible light, it seemed highly probable that if the range of sensitiveness of the eye could be extended so as to make use of these obscure rays, many new facts would immediately be revealed.

While this cannot be accomplished directly, we can, by the aid of photography, secure pictures which tell us how objects would appear if we could see them by

means of invisible light. For example, I observed that letters justined in Chinese white on a sheet of white paper, while absolutely invisible to the eye, came out coal-black when photographed with the ultra-violet ravs

During the past two years I have so far in improving the method that it is now adually possible to pilotograph the metallic vapor that rises from a drop of quicksliker at the temperature of the room, though the presence in the air could hardly be detected by the most redined methods of chemical analysis. This savors aimost of spitly pholography, experiments with the "aura", and such other fantastic fablics of which we read, and I feel sure that there will be renewed appeals from the writers of the numerous letters. I received shortly after the results of my first experiments were made justice, arging me

to devote my attention to the photography of the spirits of the departed by means of ultra-violet rays, for "hope springs eternal" And now a word or two about the ultra-violet rays

And now a word or two shout the uitra-violet rays as an introduction to my subject If n beam of suight is passed through a prism, a rain-how band of colored light is thrown upon the wall, or, as we say,

the prism has decomposed the white light late its elementary colors, forming a spectrum. If we receive this spectrum upon a photographic plate, we find that it is much longer than it appears, for there are rays beyond the violet that do not affect the eye, but that blacken the photographic plate; and the same is true in the region beyond the red, though to photograph these rays we require a specially sensitized plate. When we employ a prism cut from a crystal of quarts instead of giass, we find that the spectrum is still more extended in the ultra-violet region, the invisible portion being much longer than the visible. In other words, giass, which we are apit to regard as one of the most transparent of substances, is absolutely opaque to the shortest ultra-violet waves of light; and if we wish to make use of those ray if no un work, we

must employ a camera fitted with a lens of quarts, and must, in addition, prevent all rays of visible light from entering it. This is not an easy matter, for practically every substance that is opaque to visible light is still more opaque to the ultra-violet. To this there

Fig. 3.—White phlox, white geranium and honeysuckle in glass vase, photographed with visible light (at the left) and ultra-violet light (at the right).

are however one or two exceptions. Some ten years ago I discovered that a certain aniline compound with a long name (nitroso-dimethy-laniline), while opaque to the bine and violet actinic rays, was very transparent to the ultra-violet, and by combining this substance with other media, it was possible to prepare screens,



Fig. 4.—Photographs of reflectors, showing that nickel makes the best mirror for ultra-violet light.

or ray filters, us they are called, which transmitted only the invisible rays.

These ultra-violet screens have been extensively used in investigations made with invisible rays, both in this country and abroad, and to a certain extent in astronomical photography. A more remarkable case, how-



Fig. 5.—Portion of the moon photographed with yellow, violet and altre-violet light (left to right). Note the spot indicated by the arrow,

ever, is that of a thin film of metallic silver deposited on a plate or lens of quartz. Such a combination is transparent only to the invisible ultra-violet vays, which are completely absorbed by glass; and by stimply providing a camera with a lens of this description

g a camera with a lests of this description we can at one photograph objects as they would appear in ultra-violet light. We may use either sun-light or the light from one of the recently perfected mercury are lamps made of funed quarts, the ultraviolet radiations of which are especially powerful.

The complete opacity of giasa to these rays is beautifully illustrated by the photographs reproduced in Figs. 1 and 2. The subject is a microscope, covered with a transparent giasa bell-jar, atanding in front of a sheet of withe paper. The invisible rays used in this case came from a mercury are in a quarts tube, and we see that the hell-jar is as ogaque to them as if made of elouy. Only the two images of the mercury lamp reflected from the outer surface appear, the microscope having vanished; and the shadow is as black as if thrown by a metal ball.

If our eyes were sensitive only to the ultra-violet region, our houses would have to be provided with open windows, for glass, celluloid, and all our common transparent substances would let in no rays of light by which anything could be seen, the, we exclaim, that this mistake was not

How fortunate, we exclaim, that this mistake was not made; and yet it could not very well have been otherwise, for the materials out of which nature has developed our eyes are themselves opaque to the rays, and no evolutionary process could be expected to develop a retina sensitive to rays which never reach it. I have

found that many, though by no means all, white objects appear black in ultra-violet light, as for example, common white garden flowers. This opens up the interesting question as to whether we have selective coloring in the invisible region of the spectrum, or, in other words, are all white flowers equally dark in ultra-violet light, or is the absorbing pignent different in different flowers, and are there variations of the spectrum region absorbed? These questions are answered by Fig. 3, where we find reproduced two photographs of the public and white gerantums and honey-suckie. The with peaks of the honeysuckie and phice

sucks. The white petals of the honeysuckie and phlox come out dead black in the latter, while the gerunium are much lighter in tone. By employing a spectroscope I have found that the absorbing pigment is different in the two cases, so that we do in restly have selective coloring in this region, and we should be able to perceive coloring in this region, and we should be able to perceive coloring in this region, and we should be able to with the blossoms, if our eyes were able

to perceive color differences between various white blossoins, if our eyes were able to observe them by the obscure rays. The significance of these differences and the part, if any, they play in the economy of the plant are questions to be answered by the plant physiologists, and I prefer not to speculate about them.

to operator about term.

Ultra-violet photography has already furnished new data in astronomy and astrophysics. Prof. Hartmann of Officingen has recently photographed the great nebuta in Orion through one of the stimaviolet coriens which I described in 1858, and at the mass time by visible likely such has found that the sheeps of the trade-one as an ensawer composing the abolia, and different in the two costs. In class words, the gate which relificates the stimulation of the control of the costs of the cost

THE RESERVE OF THE PARTY OF THE

With the equipment the mechanic of modics when photography to the two photograments (if year. Survivanous, france while a many features the mangaints often plants, showing the distribution and the two games which form the mobile is a most extitute manuse.

The to the present flow my eyn investigations have been continued to the moon, as my instrumental applicance, is not powerful enough or estimates the well mounted to enable as to de much with the planets, though a few attempts have been made with the party.

with Saturn.
It may seem stronge that while we can

In the most distant stars, our ignorance regarding the constitution of our heavest neighbor, the moon, is absolute, so far a say direct evidence is concerned. There is every probability that it does not differ markedly in composition from the earth, but the spectroscope tells no nothing, for the moon is cold and shines.

as nothing, for the moon is cold and shines by nesdered light. Many terrestrial sixth presents of the present o

serier experiments, however, I noticed that a little black spot appeared close to one of the lunar craters in all the photographs taken with ultra-violet light, while no trace of it was visible in pictures made by yellow light, which represent about what we see with a vinual

ignit, when represent nous what we see with a vasual cleacope. This seemed very important, and I at once commenced experiments with a view of finding out, if possible, what the dark material might be. It was first necessary to get larger and better photographs, and secondingly I had made a concave reflector, sixteen inches in diameter with a focal length of twenty-six feet. It was useless to still yet this mirror in the usual way, since a pollabed silver surface reflects only about four per cent of the ultraviolet rays with which the work was to be done. This is very nearly the reflect.

ing power of ordinary glass for visible light. Nickel, however, behaves very much better in this region, reflecting about fifty per cent of the ultraviolet, though very inferior to silver as a reflector for visible light. This remarkable difference in the reflecting power of the two metals is well shown by the



Fig. 6.—Velcanic taff with invisible deposit of sulphur, photographed with

photographs reproduced in Fig. 4, which were made in the course of some preliminary experiments on a methdo of making astronomical reflecting telescopes autiable for uitra-violet work. The photographs are of a shallow risas dish which was silvered on the inside



Fig. 7.-Photographs of mercury vapor made by ultra-violet light.

by the chemical process used for conting telescope mirrors. This film of sliver made the surface of the glass a conductor of electricity, and by dipping the lower portion in a beth of nickel sulphate a film of the metal was deposited by a battery, after which a small patch of the silver film that remained uncoasted

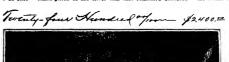


Fig. 8.—How a raised check can be detected by ultra-violet light.

with nickel was removed from the glass by scraping the surface with a pen-knife. In the photographs the sitemed part is marked Ag, the nickel  $N_i$  and the patch of clear glass G. The dish was mounted near an open window in such a position as to reflect the light of

the sky into the camera, and four phototraphs made of it, one by ordnary light and three by ultra-violet, using silver films of different thicknesses on the quarts lena, to cut off the visible rays. In number 1, made by violet light, we see that dilyer referes much more powerfully than the nickel, while the patch of clear gisse is almost black, owing to its very low refecting power. In number 2, made by the mixture of violet and ultra-violet rays, which we utilize when we employ a thin film of silver as a ray filter, we find that the silver and the nickel have about the same refereing power, while in numbers 3 and 4, taken by ultra-violet of increaswe find that the silver referes no better

ing purity, we find that the silver reflects no better than the clear glass, appearing quite black. Nickel having thus shown itself to be a suitable metal, a method was worked out for depositing it on the large mirror, and the studying of the moon was resumemirror, and the studying of the moon was resume-

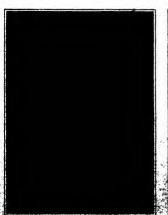
the studying of the find moon were made by light taken from three different regions of the spectrum, the yellow, violet, and ultra-violet; for it had occurred to me that it would be interesting to apply the method of three-violer photography to the case. In the usual method of making color photographs, three negatives are made through color screens corresponding to the three primary colors, and the final color picture results from them, each positive being stained with a prinary color. In the present case, however, 1, employed ultra-violet light in making one of the three original megatives, and then built up the color-picture in the usual manner. The printing operations were done for me by M I vess, the planers

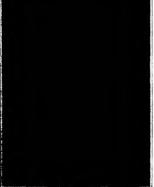
in work of this kind, and the result was n very beautiful transparent picture of the moon, in which the local differences in its reflecting power for the three regions of the spectrum utilized were strongly differentiated in color. In this picture the dark spot near the crater Aristarchus, about which i shall have more

to say presently, came out bright blue, while some of the snaria or gray spots came out reddish in tone, and others greenish, indicating differences in the unherst composition of these areas. As to the nature of the Aristarchus spot 1 have already reached a pretty definite conclusion. It is well shown in the ultra-violet photograph reproduced in Fig. 5. Referring to these three pictures of the same portions of the monit's surface, on which I have indicated the cratter Aristarchus by an account means that the indicated the cratter Aristarchus by

an arrow, we see that he pleture taken by yellow light there is no trace of the dark spot; in the one taken by violet light it is lust beginning to appear, whereas it is strongly developed in the one taken by ultra-violet. The question to be answered

(f'oncluded on page 385)





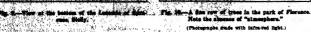




Fig. 11.—Old gate and cypress trees just outside of Florence.

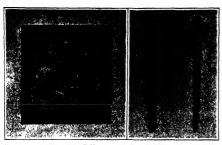


Fig. 1.—St. George and St. Valérie group and the shorter of the fourteenth century pencils are greatly deteriorated, while the larger one is preserved by a coating of varnish.

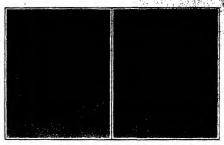


Fig. 2.—Shows a birds' drinking cup in perfect condition and a discussed and crumbling afteenth century birds' feeding cup, which in time will fall into dust.

# A Disease of Old Leaden Art Objects

## How Corrosion may be Retarded by a Protective Coating

By Jacques Boyer

A FEW years since Prof. Cohen of the University of Utrecht showed that tin is subject to a disease which can be communicated by contact from one object to another. The experiments of the Dutch chemist proved that this disease of tin is a molecular transformation, in the course of which the white metal turns gray, increases in volume by one fourth, swells, dis-integrates and finally falls off as an exceedingly fine

Prof. Camille Matignon of the College de France at-tributes to a disease of very different character the spontaneous and progressive destruction of old leaden seals, pendentives, brooches, drinking cups and feeding cups for birds, medals, pilgrims' badges and other art objects The curator of the Musée de Cluny, having made the surprising discovery that some leaden articles in the collection were gradually becoming corroded and falling to dust, while others remained intact, submitted the matter to Prof Matignon, who, analyzing the powder collected in several cabinets, found that it con-sisted chiefly of carbonate of lead, and gave the following explanation of the phenor

se leaden objects that are subject to the disease contain traces of chlorides which, by catalysts, render the metal susceptible at ordinary temperatures to the simultaneous action of the oxygen, humidity and carbon e present in the atmosphere. The catalyzer then is to its initial state, and the process is repeated indefinitely This theory is confirmed by Prof. Matig-non's detection of chlorides in the diseased specimens, and by his production of the disease in healthy speci mens by artificially infecting them with chlorides.

Several cases of this curious metallic disease are illustrated in the accompanying photographs. Fig. 3 shows a Florentine medal of the sixteenth century, by Vittore Pisano. Behind the head (that of Alphonse d'Aragon) appears a white spot, which marks the commencement of the disease. Fig. 4 shows a well pre-served pilgrim's badge of the twelfth century between two pilgrims' badges of the same period, which have

Fig 2 shows a birds' drinking cup in perfect condi-tion beside a birds' feeding cup of the fifteenth cen-tury, which is fulling into dust. The group representlng St George and St. Valerie, in Fig. 1, is greatly deteriorated, and so is the shorter of the fourteenth century pencils, while the longer pencil has been protected from the disease by a coat of varnish.

The presence of chlorides in old leaden

objects is easily explained. Many of these objects have been buried in the earth, and the varying proportion of chlorides found in different specimens is due to their longer or shorter sojourn in soil infiltrat-ed with salt water. The sea salt prob-ably causes the corrosion of the lead by forming an alkaline carbonate or bicarbonate which is afterward reconverted into chloride, or an oxychloride of lead may be formed. This hypothetical cycle requires an alkaline reaction for the in-termediate products, and Prof Matignon has detected alkalinity by depositing a drop of phthalein solution on the surface

of a corroded sheet of lead.

As a remedy, alle chemist recommends Bee SCIENTIFIC AMERICAN, June 25th, 1910. the application of a transparent celluloid varnish to leaden art objects. This protective coating retards the progress of the corrosion by excluding the air almost



Fig. 3.—A sixteenth century leaden medal, in the first stage of metal disease.

empletely, but it does not entirely prevent deteriora-

#### Making Two Automobile Lamps Do the Work of Four

A MONG the more recent developments in the automobile field, it is interesting to note that side
lampe—unmistakable evidences of the horse-drawn forbears of the modern horseless carriage—slowly but
surely are disappearing; and though the development
is a perfectly logical one, the combination of head
lamps and side lamps as now practiced by a number
of troublant results are results. superficially solved in the rush to exploit the latest innovations demanded by the buying public.

When electricity as an illuminant for automobiles

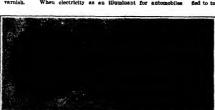


Fig. 4.—Pilgrims' badges of the twelfth cantury. Two of these are whitened by corrosion, while the third is intact.

factor of equipment and practically without exception was hastily adopted and advocated by manufacturers the possibility of eliminating side lamps was quite over-looked—a fact which is all the more astonishing in view of the present day tendency toward the elimination of all that is not absolutely neces tion of all that is not absolubly necessary for the proper operation of a car and for compliance with the laws regulating motor vehicle traffic. Now, however, light has broken in on designers and made clear that as far as the law is concerned, and also as far as the operation of a car is concerned, two lamps are all that operation of a car is concerned, two lamps are all that are required, neglecting as outside the present question the rear lamp. But, needless to add, the necessity for combining in those two lamps the functions of four lamps also became apparent and the manner in which the problem has been attacked in not a few instances makes plain that there is room for much improvement. In eliminating the side lamps, it is necessary to make provision in the head lamps for the production of con-

rably less light than ordinarily would be produ sideraby less light than ordinarily would be produced by Yull sixed bulbs and the full pressure of the bettery, and there are several ways in which this can be done. Probably the simplest way is to introduce a small rheo-stat into the circuit, but this method is open to the ob-jection that the rheestat consumes current that might be put to some better purpose; it represents a needless waste of current, in other words.

Another method is to provide a switch with which ctions of the lamps, normally multiple who full candle-power is desired, can be changed to series temporarily. In this case the lamps would consume considerably less current when "turned down" than is considerably less current when "turned down" than is normally consumed when operating at roll brilliancy. This method, though better than the method involving the use of a rheostat, has the disadvantage that the failure of one lamp of necessity means the failure of both. Apparantly, therefore, nothing remains but to make provision within the lamp for the reception of two bulls—one of say 16 to 21 candie-power for town service; and this six what has been done by several magnitudenters. Obviously, two bulbs cannot be placed in the oriented focus of a retrability reflect, one begins the principal focus of a parabolic reflector, one being large and the other small, even if this were desirable. But it is not desirable for the effect of the small bulb, if placed directly in wie focus, which would be magnified to too great an extent. It follows that the smaller

of the two bulbs must be placed some-where other than in the focus and this reduces to some extent the efficiency of the mirror when the larger of the bulbe is in use. The decrease in efficiency may be to all intents and purposes negligible, but it exists. When the side lamps are removed there is removed also a warning of the presence of the car to those approaching from the sides. Even when side lamps have no side "window" through which their light may shine and thus serve as a warning, their beams, even when but faintly reflected from the angine hood and fenders, serve this purpose. But when smaller builts are placed in the head lamps their beams are not always intense enough

# Inventions New and Interesting

Simple Patent Law: Patent Office News: Notes on Trademarks

A New Union for Piping Syste MODERN demands necessitate higher water and steam pressures in large buildings, greater hydraulic pressures in mills and factories, and generally harden conditions in all piping systems. This is substantiated by the fact that all pipe manufacturers have adopted standard full weight pipe, refusing longer to put on the

market the light weight merchant pipe.

The fittings ordinarily used are heavy cast iron, and the couplings furnished with the pipe are made of forged iron On account of the requirements of form and the abuse given them, unions used or piping systems up to the present time have been made of malicable iron, and have been the weakest link in the piping sys-

Mr. Charles A. Dies of Chicago, Illinois the inventor of a new union, in commutth many others, was aware of the li tations of existing pipe unions, and saw that there would be a big field for one which would give satisfactory and uni form service, and which would me ever-increasing demands for stronger and better piping systems.

Other inventors and manufacturers of

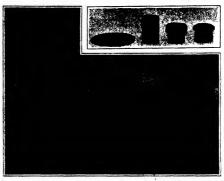
unions, like Mr. Dies, recognized that the n was not suitable for the service and have made many different attempts to improve the article. Most of these at-tempts were along the lines of changing sign, although in some case forged steel unions have been made suc constully. These eliminated most of the defects of cast unions, which had a tendency to be full of blow holes, cracks or shrinks which made them undependable Forged unions overcame also to some extent the trouble with all malleable union due to their unequal expansion and contraction with the steel pipe with which they are connected. The great trouble with the hot-forged union, however, was that its cost was so great as to make it ost prohibitive.

largely used to-day, the only objection being that they are too heavy and cumbersome, as well as very expensive.

Mr. Dies, using his knowledge of metal drawing and forging, went at the problem of devising a stronger union by choosing a new material, instead of trying to make a better union than the others from a cast ing. He accomplished this by drawing the various parts from cold flat strips of rolled open hearth steel. We illustrate four stages in the process of forming the male end. The first operation punches from the flat strip, a disk or blank of suit able size. This blank is then cupped and redrawn into a deep cup or cylinder, from which the bottom is punched to form a seamless tube, as shown in the second illustration. One end of this is then folded or rolled back un itself to form a reinforcement for the seat pictured in the next figure. Further operations co press and shape this seit, and put the beading on the lower end as see fourth engraving.

The female end is formed similarly, the differences coming in the last few oper-ations, which alter the shape of the seat The seat or joint between the en union consists of the hardened and densi union consists of the marcener and gener-fied seat of the male end opposed to a soft brass seat or cushion drawn from dead soft sheet brass, and forced into place in the fluished female shd. This

place in the fluthed female end. This gives an ideal combination—a hardened steel used against a not breas seat. All the forming operations are per-formed upon the metal while it is cold, and the seats are bot machined or ground in any way, but despend for their accuracy and form entirely upon the pressure ar-pited to choose in the general. Score of



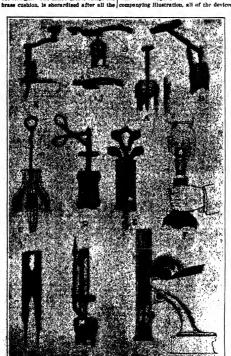
Presses with which the unions are made. The insert shows four stages in the

these presses are illustrated in the accomination threading is done, so that every part of banying engraving.

panying engraving.

The threading is done in specially constructed machines and the internal threads on the male and female ends are tapered to a Briggs Standard pipe thread, while the threads on the coupling nut are cut straight. The entire union, except the

Some Old Cork Extractors THE necessity of some form of cork ex-tractors is experienced by all, and it may be interesting to review some of the well known implements shown in the ac-



pictured being found among the expired

In A we find a device having a shank ed at its lower cud to penetrate through a cork, and provided with a short pivoted cross bar for ulining with the cork, but turning at a right angle to with draw the cork.

The corkserew B has the handle pivoted to the screw part and a prop is also pivoted to the bandle and it may be rest-ed against the bottle lip to form a fulcrum for the handle so that the last can operate as a lever to pull the cork, while C illustrates a simple wire cage for withdrawing corks that have been forced down into a bottle

A double lever in scissors shape is presented in D. and this can be used in connection with any handled corkscrow. etch E shows a stand to rest upon a bottle, and having a threaded shaft carrying the screw and a separate not operating on the threaded shank to pull the cork

Simple extractors having bludes to project down on opposite sides of the cork represented in F and G. shows an extractor in which a stand mounted on the bottle neck has at its up-per end a windluss connected by a chain with the corkscrew, so that it can exe force to pull the cork.

In I is shown an extractor adouted to be secured to a beach or counter and sup piled with a hand lever, whose rack seg tion to force the corkscrew into the cork. and when reversed, to pull the cork out of the bottle so as to free the cork from the screw.

J represents a novel form of corkscrew which can be folded as shown in the s er engraving to conveniently carry in the pocket, and can then be opened as shown in the larger one, to operate first as a andled corkscrew in turning the serous into the cork and then as a lever in extracting the cork from the bottle; and K presents a bench or counter extractor in which a screw turns into the cork and a spring when compressed aids in drawing

## Notes for Inventors

Fillings for Artificial Dentures.-- In patent No. 1,070,442, Ernest Fogg of New-castle-upon-Tyne, England, provides separate filling-pieces which fit and are secured in the interstices between adjacent teeth and fill such spaces

An Imitation of Pieced Fur Skins. An imitation of Pieced Fur Skins.— Richard J Steiner of Philadelphia has patented, No. 1,009,588, a mothod of producing mitation pieced fabrics in which the nap of a pile fabric is laid in certain sections in a different direction from other ctions with the individual sections subdivided by suture lines formed in the nap of the fabric

A Self-releasing Bowling Ball Handle In a patent, No. 1,068,389, to John W. Hyatt of Newark, N. J., is presented a bowling ball handle which has a movable device for locking the handle to the hall. A cord connects the device with the wri of the bowler so that when the handle is released in delivering the ball the cord will operate to release the movable device free the handle from the ball

Multi-color Lights for Moving Pictures. Multi-color lights for moving rictures.

—A projecting apparatus for moving pic-tures has been patented, No 1,070,699, by Isidor Kitsee of Philadelphia, in which a plurality of electric lights each producing a light of different color from the others, and which may be extinguished and and which may be extinguished and energized in succession, said lights being controlled in a predetermined order by means operatively related to the film advancing means.

## Co-Founder, With Darwin, of the Modern Theory of Evolution

By Benjamin C. Gruenberg

THE remarkable fact that two men at opposite ends of the earth had worked out, unknown to each other, an identical solution to the problem of the genesis of species, has been so often told that it hardly needs to be repeated. Each of these two tens, with a modesty that is rare even among accentists, constantly insisted that all honor for the great discovery was due to the other. For more than the state of the state of

jesionsy. One of these men, Charles Darwin, died in April, 1884; the other, Alfred Russel Wallace, has just passed away.

Alfred Russel Wallace was born in Usk, Mommouthshire, England, on January 8th, 1873. He received an elementary detection for a cycle of the center of the control of the

new forms. He cultivated this interest so that out of it diveloped a large part of his life work and a large part of his life work and the collegate Institute at Leicester. This was an unportant year for him, as in it occurred a few trifling events that turned the whole course of his life. It was here that he hecanne acquainted with Henry Weller Bates, a clerk in Allsouph hereor is here the second of his life. It was here that he hecanne acquainted with Henry Weller Bates, a clerk in Allsouph hereor is here the second of his life. It was here that he had not a strong deare to vasit the tropics, a dealer strengthened later by reading Darwin's account of the worage of the "Pleagle," and here that he read Malthar's "Peway on Population."

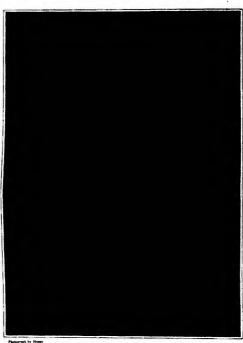
"Peway on Population...

"Peway on Population...

"Peway on Population...

"

ouly. On the addies of these two men he prepared an abstract of his theory, and this abstract was commended in the commended of the commended



ALFRED RUSSEL WALLACE

a "brief abstract" of his theory. This brief abstract was published in Norember of 1859 as a "small book" of about 300 pages—"The Origin of Species." Since then the dectrine of "Natural Selection" has gone under the name of Darwinsm. In a letter to Joseph Hooker with-

the doctrine of "Natural Sciection" has gone under the imme of Darwins. In a letter to Joseph Hooker written in 1886 Husley writers.

"Walked's impetus seem to have set Darwin going in "Walked's impetus seem to have set Darwin going in "Walked's impetus seem to have set shall leven the view at last. I look forward to a great revolution being effected". The communication from Walked did extrainly serve to accelerate Darwin's work; but it would be a serious mistake to suppose that the service of Walked has a serious mistake to suppose that the service of Walked has a serious mistake to suppose that the service of Walked has a serious mistake to suppose that the service of Walked Among biologists Walked has right along shared fully with Darwin the credit for discovering the law of the natural chination of the unadapted.

Among biologists Walked has right along shared fully with Darwin the credit for discovering the law of the natural chination of the unadapted.

It is the in devancing the development of discovering the law of discovering the law of discovering the three of the property declared himself shamed to accept the credit. On the other hand, Darwin never lost an opportunity to explait Walked's abare in the theory. In 1870 Walked's palae in the theory, In 1870 Walked's abare in the theory.

published a collection of his casays, with some changes and additions, under the title "Contributions to the Theory of Natural Selection." The closico or title title is inferentiag as howing wallaced; fevertion to Darwin and to the "casas," for some four years previously his had written to Darwin on the great smoont of missishers standing that had artess from the use of the capronate standing that had artess from the use of the capronates standing that had artess from the use of the capronates therefore the previous of the capronates at the control of the capronates of the capronat

meth, and accounted for the difference between male and female birds, as regards plumage, solety as the result of neutral selection. In this book he also reastirmed his conviction to the development of the conviction to the development of th

San Carlotte

# STEED STEEDSBEVE

sent tree on request. This explains for hole terms, ste., in regard to PATENTE. ADE MARKS FOREIGN PATENTS.

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## stography by Invisible Light

(Concluded from page 251.)
was; "Can we find any terrestrial mineral

which behaves in the same way?" I photo graphed a large number of specimens of rock, many of them of volcanic origin, and finally found one to reproduce the behavior of the Aristarchus spot almos exactly. It was a yellowish gray volcanic tuff, identical in its appearance with an-other specimen of tuff, which, however, did not show the peculiarity of photographing dark in ultra-violet light.

I next made a chemical analysis of the small chip, and found that it contained

small chip, and found that it contained from and traces of sulphur, but photo-graphs of rocks stained with irou had shown that the iron stains came out equalty dark in violet and ultra-violet. There remained the sulphur, however, and to test this point a very thin deposit of sulphur invisible to the eye was formed of sulphur invisible to the eye was formed on the surface of the larger piece of tuff, by directing a jet of sulphur vapor against it for a second or two. The fragment, when photographed by the three different when photographed by the three different types of rays, showed no trace of the de-posit in the yellow picture, and only a faint trace of it in the violet one, but in the ultra-violet picture the deposit came out quite black, (See Fig. 6.) This makes it appear very probable that the dark deto sulphur, or to the presence of rocks containing sulphur. Its immense exten makes me think, however, that it is an actual deposit thrown down by an im-mense blast of gases from the crater. The discovery of sulphur in the vicinity

of a lunar crater is of considerable im-portance, since there has been a good deal of discussion as to whether the so-called "craters" are really of volcanic origin Should further investigations reveal the ce of similar deposits in the vicin My of other craters, it would be a strong argument in favor of the volcanic theory because sulphur is almost invariably found in regions which either are, or have been, centers of volcanic activity. It is a curious circumstance that but one of these deposits has been found thus far on the moon. Other smaller ones doubtless exist and can be picked up with a mor owerful reflector

In the laboratory I have been carrying on a variety of investigations with invisi-ble rays. These for the most part have tr do with rather abstruce problems in physical optics and spectroscopy, and I shall mention but a single case as illustrating mention but a single case as illustrating how the ultra-violet rays can be utilized in rendering visible the vapor given of by a metal, even at the temperature of the room.

Mercury is known to give off a vap that is very injurious to the health of workmen exposed continuously to the fumes. But it is of such extreme tenuity that a volume of air represented by a cube measuring nearly eight feet on each ide, after it has taken up all of the vapor it can hold, contains only about a cubic inch of pure mercury vapor, such as is given off from the boiling metal. Not-withstanding the fact that even the pure vapor is absolutely invisible, and as tran parent as air, it can, even when diluted with 800,000 parts of air, be photographed by the ultra-violet rays given off from a

by the ultra-violet rays given out from a new type of lamp I have designed to meet the special requirements of the case. This lamp, which I have named a reson-ance lamp, is nothing but a small bulb made of fused quarts, highly exhausted and containing a drop of mercury. The vacuum in this bulb is as perfect as can be able to the party meeterial athermore. be obtained by any mercurial air-pump and yet I have found that, if the ultra and yet I have found that, if the ultra-violet light from a mercony are be con-centrated to a forms at the center of the vacuous space, the lighty parefield mer-ters are reported by the substantial of substantial that of feeble intensity, but or great purify. To this faith light emitted by the bulls the vapor of sept-sary is quita opeaus, so much so, in fact, that we say photograph the vapor gives off from the metal-at venue temperature, hat is shown by Fig. 7, in which we have two persons of a, small quarter facts,



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s made in manuscripts and so-called leed checks." The best chemical ink "relead checks." "raised checks." The best chemical inserances remove the writing and leave absolutely no visible stain or other evidence solutely no visible stain or ourse evuesues upon the surface of the paper, and photography, by any of the usual methods, shown no evidence of tampering. If however we photograph the manuscript with ultraviolet light, the spot upon which the craser has been used shows up in the price. ture as a dark smudge, for the cher has given to the paper the power of absorbing the invisible rays, just as ordi nary ink causes it to absorb visible light.

A sample of a raised check was prepared for me by a well known authority on questioned documents The check originally called for twenty-four dollars, bu by erasing the heavy ink line drawn after the twenty-four and insertion of the word hundred. I was unable to detect any sign of aiterations and the cashler of one of our largest banking houses, to whom I showed it, said that it appeared to him to be all right. The photograph made with uitra-violet light told the story however in a manner that would convince any jury. The original writing and the ultra violet photograph of it are reproduced in Fig. 8.

The advantage of this method lies in the fact that the manuscript is not in-jured in any way by the examination, as is the case when chemical treatments are resorted to to show the use of an ink eraser, for it is often of importance to conceal the fact that the document has

een questioned.

In the case of a certain disputed docu ment which was submitted to me recently, the ultra-violet rays actually brought out traces of the erased words. A mercury iamp of fused silica was used for illuminating the manuscript, and the quarts lens used for photographing it was silvered with a film thick enough to render a tungsten lamp invisible through It.

My experiments with the infra-red rays ay experiments with the intra-red rays have been confined thus far to the photog-raphy of landscapes, though I have no doubt that interesting data could be ob-tained by-applying the method to celestial photography, for these rays have a re-markable power of penetrating a planet's atmosphere without suffering diffusion. In photographs made by the infra-red rays, green vegetation in full sunlight rays, green vegetation in full sunlight comes out as white as snow, while a clear blue sky appears almost as black as mid-night. This is due to the circumstance that the rays come through our atmo-sphere without being scattered, for it is exteted light that gives the sky its color and luminosity. I have recently obtained some very fine examples of these infrared photographs in Sicily and Italy, some of them being extremely decorative. In Fig. 9 we have a view taken at the bottom of the Latomia of Syracuse. This is the ancient quarry, in which the conis the ancient quarry, in which the con-quered Athenian army was imprisoned, and the view was taken looking out through the mouth of a cave-like forma-tion at a group of young aimond trees, with which the bottom of the quarry is overgrown. The green folloge comes out white, as if the trees were in blesson, and the sky near the top of the picture is almost as dark as the deep shadows with-in the cave. It is only a were clear him.



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it down to the horizon where the haze is at down to the normal where the name is whiter, we see that it brightens percept-ibly. A fine rew of trees in the park of Florence is shown in Fig. 10, the end of shown in Fig. 10, the end of the vista appearing quite as sharp and lacking in "atmosphere" as the fore-ground, owing to the penetrating power of

In Fig. 11 we have an old gate and a row of cypress trees on the road to Grasens just outside of Florence. In this cas the sky was not quite free from haze, and in consequence is not quite as dark as in the other pictures. Nevertheless even the dark green of the cypress foliage es out brighter than the sky.

I received so many letters asking for particulars regarding the method of mak--red pictures, that a fer words regarding the technique may not be out of place. They can be made with any camera provided with a ray filter (glass cell) that can be filled with a solution A saturated solution of bichromate of pot ash is put into the cell, and a strong solu tion of the aniline dye "cyanine" added until the color of the transmitted light is a very dark blood red. The scree be tested by looking at sunlit folinge against a dark blue sky, covering the head entirely with a black cloth to cut off all rays except those which come through the screen. The leaves should appear much brighter than the sky, and, if they do not, more cyanine must be added. This screen is placed in front of the lens, and an exposure of from three to five m given with an F 8 stop on a Cramer "Spec trum" plate. Ordinary ortho or trichro-matic plates will not do In England a spectrum plate is manufactured by Wra-ten & Wainwright.

These rays, which I have for conveni-ence termed infra-red rays, are not quite invisible, though they have such a feeble action on the retina as to play no part in ordinary vision, and we can see objects by them only when the eyes are carefully protected from other light. The true infra-red rays lie just beyond these d red rays, though we cannot draw any sharp line between them, for eyes vary much in sensibility in this region of the

It seems not unlikely that photographs of the planets taken by these rays will prove interesting, owing to their power of penetrating an atmosphere illuminated sunlight. If a planet is surrounded by a light-scattering atmosphere, as is the earth, we can see its surface only through a luminous haze, which would be wiped out, to a certain extent at least, if we utilized only the infra-red rays in making our observations.

It is my hope that experiments in this

direction will be made with some of the larger photographic telescopes. I espe-cially commend the case of Mars, the appearance of whose surface certainly suggests that we are viewing it through a somewhat luminous atmosphere.

It is easy to see, from the few cases I have cited, that things appear to us as they do merely from the circumstance that our eyes happen to be sensitive to a definite region of the spectrum.

## Alfred Russel Wallace

laded from page 384.)

rested. In the same way he falled to appreciate the importance of the laws of heredity discovered by Gregor Mendel and later rediscovered independently by the Dutchman DeVries, the German Cor as and the Austrian Tschermak, because he did not differentiate these laws cause he did not differentiate these laws from what had been known to Darwin, and because he could not see their appli-cation to the problem of evolution of e-gains forms. He also failed to appreciate the distinction between different classes of "variations" that have been forced upon us in part through mathematical studies and in part through breeding experiments In all these cases, and some others, Wal-lane stead by the old as opposed to the new ideas.

Wheever accepts the principle of evolu-tion must recognize that it applies the hamin bloss as well as to institutions

# The Chronology of Aviation

THE Scientific American has received from Mr. Hudson Maxim and Mr. William J. Hammer, a limited number of the reprints which they have just issued of the very complete "Chronology of Avaston," originally prepared by these gentlemen for the World Almana of 1911. The data embrace the essential facts relating to aerial progress. In addition to a short historical rissumd, one finds herein tables giving altitude records, speed records, quick starting and slow-speed records, passenger carrying. English Channel and other over-water flights, cross-country flights, notable dustace and duration flights, etc. There are also statistics relating to accidents and data relative to spherical and dirigible balloons or sirships, etc. Of no small interest are the tables giving the most important flights of the Wright brothers. There are doubtless many readens of the Scientific American who are much interested in this subject and how would be glid to secure a copy of this interesting brockurts. They can do so by applying to the Aeronautic Editor of the SCIENTIFIC AMERICAN, 361 BROADWAY. NEW YORK SCIENTIFIC AMERICAN, 361 BROADWAY, NEW YORK

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not all or always of before his death.

friends, led by Charles Darwin a civil ision was obtained for Wallace in 1881, in recognition of his services to science With this and the income from his writ iugs he was able to live quietly withou for unlike Darwin he had no independen inc me He resided in various parts of Fugland for over thirty years In 1886 be visited this country to deliver the I owell lectures

Far from being a narrow pedant, wedded to his specialty to the exclusion of other matters Wallace was a man of d interests and deep sympath an indication of the wide range of his in an indication of the wide range of ma in tellectual activities it may be worth while to note that he devoted a great deal of time to the study of the so-called 183 this lihenomena and wrote a book on the subject called Miracles and Modern Spiritualism (1875) He believed the ul ject t be of vital importance and tried ice Huxley Tyndall and other scien tists to undertake a serious study of the matter. He succeeded uly in convincing them that the frauds which they discov ered were an integral part of the whole business. He was interested in many so-cial problems but here too showed his inability to mak a sound analysis of the phenomena for he was at one and the same time a Single taxer and a Social ist For a number if years he was presi dent of the I and Nationalization Society and in 1882 published a book on the land

and in In-2 published a book on the land question called Land Nationalization Its Necessity and Its Aims His failure to understand the physiology of modern medical discoveries is shown by his espou sal of the antivaccination cause which he also wrote a great deal

Among his later publications are The Wonderful Century Its Successes and Its Lattures (1800) Studies Scientific and 8 rdal (1900) Man s Place in the Uni verse (1903) in which he tried to show that the earth was the only inhabited celestial tody was in the center of the miverse and that man was the aim and end of the whole cosmic price a stoblography in two volumes called M:

On the fiftieth at niversary of the read ing of the Darwii Wallace paper befor the Linnsen Society this body held special meeting and conferred upon Wal lace a gold Darwin Wallace medal Copies of this in silver were presented to Sir present at both of these memorable meet ings and to Francis Galton Ray Lankes ter August Weismann Ernst Haeckel, and Fdouard Strasburger Never connect with any university either as student as instructor Wallace was honored by special degrees from a number of insti

An able man and a hard worker An sine man sanu a narta worker he leaves his writings as a monument to his industry and to his devotion to the ad vancement of truth An intensely human man he had a host of friends, among those who agreed with him, and also among those who did not.

Ramoving the Shine from Fabriss.—
A device for removing the gloss or polish from vorn woven fabriss, is shown in patent No 1,004 784 to Walter A Sashmun and Matthew R. Berger of Philadelphia, Penn, and includes a suitable osasig having openings in its bottom through which project a large centrally disposed roller and a pair of musler side rollers when have tristion material on their peripheries, the rollers being gausset for statement of the rollers and a core the centre of the state of the rollers being gausset for the rollers of the state care. grater to test the movement or use rought over the surface of the sidth senses one roller to turn in one direction and compain the other roller to move in the sipposite direction, thus picking up the series of the fabric to take off the gloss or policies.



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## THE WEEKLY JOURNAL OF PRACTICAL INFORMATION

YOUR CIX 1

## NEW YORK, NOVEMBER 22, 1913

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Waighing Haif a Million Freight Cars
THE importance of the weighing of freight cars on
a great railway system can be readily appreciated,
as it is the basis on which charges for transportation
are assessed and is a matter in which both shipper and
courtier have the greatest concern. Nowhere is this impressed more forcibly than at one of the great railroad presson more roccupy, man at one or the great railroad centers where the freight cars are weighed and distributed to be made up into proper trains. Such a yard is that at Juniata, Pa., on the Pennsylvania Railroad, and over its track scales passes an enormous volume of traffic. In the year 1912, 488,194 cars with an aggregate weight of 23,065,750 tons were weighed at the Juniata scates, which involved freight earnings totaling the not inconsiderable sum of \$25,312,857.92.

Is it to be wondered, therefore, that the design, con-traction, and maintenance of track scales are a matter of prime importance, for an error seemingly slight ff a single weighing if continued would soon run into start-ling figures with a corresponding effect on the revenue account to the disadvantage of either the railroad, ship-per, or the stockholder.

representative of the SCIENTIFIC AMERICAN recertly witnessed the regular routine weighing at the Juniata scales and observed a periodic test. With an average of 1,507 cars weighed daily, the question of getting the cars to and on the scales, as well as weighing them with proper accuracy, becomes an interesting problem. So rapidly must the cars be moved and made up into trains that they are weighed in motion, as one by one, cut loose from a train pushed by a switching enging, they pass across a 52-foot scale rail on the platform of the scale, and then passing off by gravity they are switched to the proper classification tracks.

The estrance to the classification yard is over the

scales, which are provided in duplicate, an emergency scale the exact counterpart of the regular scale being located by its side. These scales, shown in the illustra-tion, represent the standard practice of the Pennsyl-vania Railroad and consist of a four-section lever scale fitted with suspension bearings, where the load is hung from the knife edges of the main levers and is not supersed directly upon them as in the case of older. The main levers are transverse to the principal axis of the scale and communicate their motion to the center or extension levers, by which it is transm to the fifth lever and thence to the beam, the general arrangement being that of a compound lever having the same effect as a simple lever, where a weight of 25

ng on the end of a power arm 12,000 th as long as the weight arm, would support a weight of 300,000 pounds. There is a relieving gear consisting of mechanical jucks supporting the bridge frame on which the ties and track are list, operated by a toggle joint arrangement worked by a cylinder and piston suppiled with hydraulic or air pressure and at the control of the weighmaster with a valve, so that the bridge or girders carrying the track can be relieved and supported a train, car or engine is passing without being weighed

In weighing a car it is brought to the scales in a long train amounting sometimes to one hundred cars.

At a point about 50 feet from the end of the scale
the grade begins to rise, forming whal is termed a humu in the track. As the end car reaches the upes of this hump it is uncoupled and then pushed over, and due to the descending grade it leaves the train at some what greater speed, but never more than four miles an hour, and passes across the scale platform. aster and his cierk stand in front of the beam in a bay window in the scale house and as the car gets on the track the movable police is adjusted until the beam balances, when the indicated weight is called to the cierk, who by this time has noted the number of the car and the stenciled tare or weight of the car empty painted on its side. The car then passes off the scale platform, which is at a grade of 08 per cent, and down a short plece of straight track, where it is switched as desired. If the weighmaster detects an overloaded car he pulls the cord of a whistic and the overloaded car he paint could be trimmed or exhalled, or in case the car goes so fast that the weighmaster is unable to make a rending it is sent to a track whence it can be taken over to the scale again by a switching

Steadily the cars pass over the scale, and the v master rapidly moves it along the beam after a swift glance to gain a general idea of the kind of our and, if open, its contents. Three or four cars a minute can

dight, in contents. Fare of long can a minute of the weighed by an expert weighed accurately at rest by the scale inspectors is included in a train as a surprise test for the weighmaster The scale itself is balanced daily before beginning weighing and is frequently tested master with loaded cars at rest on dit parts of the platform. As the scale is a companied lever in four sections and the weight is distributed on eight main bearings or knife edges of the main levers it is

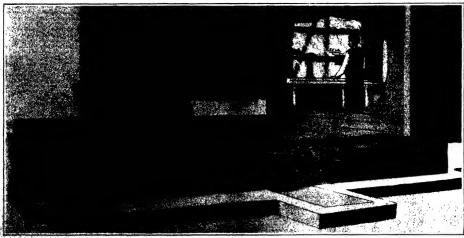
wirable to test each set with the load directly above them. The usual method is to take a to et welght eur mit low self-contidued cur of all metal construction, and pincing it successively above each set of main levers, make a series of readings. The master serie on which the test car is weighed and scaled is accurate to one part in 50,000, being adjusted and calibrated to United States standard weights

In the test witnessed by the writer, the test car was just from the master scale and its scaled weight was exactly 30,000 pounds. It was placed on the scales and the polse was moved along the beam until it balanced, swinging freely and coming to a position of rest The main pose is graduated to 1,000 pounds and the fractional or lower polse enables readings down to t0 pounds to be made. The emergency scale when test-ed was shown correct for all sections, and the same was true for the regular scale with the exception of ection which was 10 pounds out of the way , which

led the hispector to examine the appropriate levers. All the rendings being the same at each section is not necessarily guarantee to the correctness of the scale ss they are the same as the weight of the test dat ent. If all differ the adjustment must be made weight em at the virtous lovers by a process of that and error if all readings agree, but are to error by the same amount, then a shapte adjustment of the length of the fifth lever is usually sufficient to make the scale ac curate

If the scales are kept clean and properly maintained, there is little need of adjustment. The tevers of such a scale are all carefully scaled and adjusted in the shops and the parts are all interchangeable so that in case of accident, on receipt of a tetegraph order, a new part can be sent by passenger train from the scale shop

The process of scale testing is rather compilerted in its application and practice, and the technique only comes with considerable experience. The inspector goes about with his test car on a trip of from six to eight weeks testing scales and then returns to Altoon for a reweighing on the master scale, and examination of the ear, as only the most necessary repairs are allowed on the road. The bearings are responded and the car thoroughly cleaned. This work on the Pennsylvania is well done and on a few other great systems, but there has o much discussion of the shortcomings of railroad weighing that there is now in progress an investigation by the United States Government of the track scales throughout the country



Weighing a fraight our on a Pennsylvania Railroad 52-foot standard 300,000-pound capacity track scale. ear supporting the bridge frame when no weighing is in pro-

## SCIENTIFIC AMERICAN

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The Editor is elways giad to receive for examination illustrated erticles on subjects of timely interest. If the photographs are store, the articles shows, and the fact outlemtic, the contributions will receive special attention. Accepted articles will be paid for et

The purpose of this journal is to record accurately, simply, and interestingly, the world's progress in scientific knowledge and industrial achievement.

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#### Water Supply of Cities Ancient and Modern

II.I. it surprise the citizens of New York, in the year 1013, to home the citizens of New York, in the year 1013, to learn, if they did not know it before, that the clizens of Imperial Rome in the year A 1 300, or thereabouts, were favored with a supply daily of somewhat over 400 galions of water per cupita, as against a supply daily of about 100 gailous per capita which is available at the present writing in this city? Manhattan and the Bronx, with a population of about 3,000,000, receive daily from the troton watershed about 300,000,000 gallons; but Imperial Rome brought in by aqueduct, chiefly from the distant bills that encircle the Campagna, over 400,000,000 gallons of water per day—and this, by the way, is four fifths of the total supply which will be led from the Catskill monutains to this city, when the new Aquednet is completed—and New York, be it remembered, in respect of its water supply, ranks high among the capital cities that are the boast of our modern clvilization.

A great constructive people were those Romans of the days of the Cosars Of pure science they knew not a little, and in provilcal science so adept were they, that the monuments of their engineering skill take rank with the noblest engineering works of the twentieth

Consider this matter of water supply. Any one who is not fully conversant with the luxurious life of that great people might readily suppose from the statis ties which we have given above, that they were afflicted with a positive mania for aqueduct building. Nothing of the kind. The Romans had a full appreciation of the value of an abundant supply of pure water, as min-letering to the health, the pastimes and the artistic delight of a city of one million souls. The Romans of Imperial days had a passion for cleanliness of body. imperial days mad a passion for cignifines or body, and the singendous public baths such as those of Trajan block-thm and Constantine, were capable of accommodating at one time from 1,800 to 3,800 bathers.

Says Prof Lanciant: "If we take 1,500 people as the average accommodation of each of the public therms and 50 as that of each of the private buths, we find that in ancient Rome at any given time, nearly 63,000 that in ancient Home at any given time, nearly 63,000 citizens could restore their strength in boths of every inture and description." The water in Rome was the property of the crown, and it was led to the private bouses by thousands of pipes, which run in every direction and under every street, and were stamped with the name of the "Concessionaire" to whom it was brought from the nearest crown-reservoir

The Roman was nothing if he was not artistle, and huge droughts were made upon the city supply for magnificent series of public fountains which graced the public squares and plazas, and were to be found casting forth the mountain waters from every point of vantage. To these must be added the thousands of foundalis which played in the gardens and courts of houses and villas of pretention, to say nothing of the supply which was necessary to maintain the beau-tiful casendes and slicut pools which formed one of the most lovely attractions of a Roman garden

To the engineer and artist allke, the most attractive feature of the water supply of Rome Is the namedness. the remains of which, in many a mile of picturesque

ruins, radiate across the desolate and solilary waste of the once fortile Campagna in the direction of the distant hills. Of these aquedacts there were eleven, or, if we include the tributaries, fourteen in all. Their individual length varied from a minimum of eleven miles to a maximum of fifty-side miles. Their total length was three hundred and fifty-nine miles, and of the street of the st this, three hundred and four miles were below ground and fifty-five miles were carried on monumental areades of massary, much of which has survived practically ct for upward of two thousand years.

The question may be asked as to why the Roman engineers built these grade-line aqueducts, bringing the water across the Campagna in costly elevated artificial river beds, when they might have built condnits that followed the undulations of the country and were sunk only a few feet below the surface. The answer is that the Romans had no cast iron or other suitable material to construct the strong piping which would have been to construct the strong piping which would make need necessary to withstand the pressures. They were acqualated with the principles of the siphon; indeed they built many notable specimens, one of which, that of Alatri, built a century and a half before the Christian era, was capable of supporting, we are told, a pres sure of 140 pounds per square inch.

Let it be understood, furthermore, that the Romans ot merely divert the water from the river beds into their aqueducts, thereby exposing the supply to contamination by the mad and silt of the river floods. On the contrary, they thoroughly understood, and practiced on a grand scale, the art of impounding the sup-ply by means of artificial dams. Thus the valley of Anio was dammed at three successive places, and at each dam was formed an artificial basin, in which the water deposited its sediment and from which it was led off, clear and pure, to the city Also, the Roman engineers understood all about tunnel construction, and in one case, between Tivoli and S Gericomio a tunnel some three miles in length was driven through

the mountain simply for the conveyance of the water.

All of which reads very much like some of those descriptions which we have published recently in these columns of the great water supply systems of Los Angeles and New York.

## Science and the Education of the Future

O the average citizen of to-day science appeals through its manifold applications. Its function appears primarily, to some perhaps wholly, utilitarian Indeed, some hold that science which does not lend to practical application is heresy.

If this be so, it appears at first sight as if science a subject of study for the young, the adolescent and the mature, could never offer more than a limited eduthe mature, could never order more man a limited con-cuttonal discipline. But this is an utterly false con-clinsion. It arises out of a misconception of the meaning underlying that much-abused word "practical". Any thing or action is "practical," which is conductive of benefit to mankind. It is a grossiy narrow view which sees benefit only in the production, transportati and barrering of merchandise—whether this be food, clothing, buildings, materials of construction or what not—and which reckons scientific pursuits as "practical" only if they can be traced forward to the mate production of such merchandise

The needs of man are not purely material. From oriai his mind has hungered for an interpretation of the phenomena of nature about him. Primitive man of the gray dawn of history, and the savage of to-day, peoples space about him with spirits and demons, to whom he ascribes the power of shaping events and destiny. To them he offers supplication to engage their favor and to appease their anger dest kind of religion, is at the same time the crudest kind of science Because it ims no obvious rela-tion to the production of merchandise, are we to remain indifferent to the development of this aspect of science? if we could do so without forfeiting all our industrial nchlevements, would we be willing to go back to that state of seientific ignorance which would lid us offer luman sacrifice to appease a rain god? Would it be "practical" to do so? Men forget that evil comes not only of ill-will, but also of ignorance, and that science brings benefits by clearing our vision \_s matter which may be of greater importance than the invention of some "practical" machine or process

Viewed in this way, science has a high humanitarian value, and its study must rank side by side with that of ancient and modern itterature. If any one still do ancient and modern itterature. If any one still do sk himself how many works of literature or fetton have had a greater influence upon modern thought in all its phases and throughout the civilized world then och-making volumes in which Darwin has laid down his classical researches and reflections upon evo

In the education of future generations we may well expect that science will be given a more and more insortant place. This not only because the young must

be prepared for the tasks by which they will later to years earn their subsistence, but also because scie strued broadly, has its le topics of the most vital interest to the life of body and topics of the most vital interest to the life of body and soul. We would not contend that it can ever take the place entirely of literature and art in its formative influence upon character; but it will be a complement to them, a complement for which there is a crying need Literature and art deal with ideals; science deals with reality. Literature and art point us a way, show us an aim, science teaches us the limitations of our resources and powers, and brings us b from the world of dreams to the world of action, from the world of purposes to that of accomplishment. It makes in "practical" in the best sense of the word, for 'practical" indeed we must be in order to translate our ideals into reality.

#### Which End of a Post Should Be Up?

T is a very common belief among farmers that a post will last longer if set in the ground the reverse of the way it grew in the tree, in other words, with the huit end up. Accordingly, one sees many posts, es-pecially end and gate posts, with the small end down. osition is that sap in a tree is always asce ing, or at least that it is easier for the sap to go up than down. Consequently, it is argued, turning a post upside down tends to prevent the rise of water, helps keep the wood dry and therefore readers it less liable As a matter of fact, sap or water can fie in either direction with equal facility and the popular notion to the contrary is incorrect.

Careful experiments on the relative durability of ost timbers have been made by the Ohio Agricultural Experiment Station and the above question was considered. One fence in particular contained 189 black locust posts, of which 86 were set with the top end up, 30 with the top end down, and 31 did not si what position they were set. At the end of 20 years 30 posts, or 10 per cent, were decayed. Of this number 15 were top up, 13 top down, and 4 undetermined. In other words one third of those set top down rotted off, as compared with only a little over one sixth of those set top up. From this and numerous other observations sion was reached "that there is no differen which end is put in the ground, except that the sound-

The decay of a past is mostly at the ground line, since it is there that the conditions as to nir and moisture are most favorable to the development of rot-causing fungl. Other things being equal, the larger the post the longer it will last. Inverting a post often means putting the small end in the ground, and where this is done the time required to rot it off is less than where the blg end is down If both ends are equally sound the larger should go in the ground. If one end is defec-tive is should be up, since the conditions above ground are many times more favorable to durability than just at or below the ground line.

## What Is Impure Air?

HE Smithsonian Institution has recently published a revolutionary memoir by Prof. Leonard hinded a revolutionary memorir by Prof. Leonard Hilli and several collaborators, eattlied "The in-fluence of the Atmosphere on Our Health and Comfort in Conflued and Crowded Places." A main purpose of the memorir is to show that the chemical quality of the air in crowded and stuffy rooms has nothing to do with its ill effects, and that, apart from the influence of infecting bacterla, the ventilation problem is essentially one of the temperature, relative humidity and movement of the air. The ordinary tests of air for carbon dioxide are declared to be worthless. The percentage of carbon dioxide in the worst ventilated room does not rise above 0.5 or, at most, I per cent, whereas the normal concentration of carbon dioxide in the lungs is from 5 to 6 per cent of an atmosphere. The writers adduce a great number of experiments and observations to prove that percentages regarded as deleterious or deadly by hygienlets are quite harfniess. They claim that it is also a follacy to assume that a diminished amount of oxygen is harmful. At noted health resorts in the Aips the barometer stands at such a height that the concentration of exygen is far less than in the most ill-ventilated room. One unfortunate result of this fallacy is that the laws regarding ventilation of mines insist on a high percentage of oxygen, and thereby increase the danger of mine explosions. Finally, the widespread belief in the presence of an organic poison in expired air is equally erroneous. The smells of crowded rooms and the like are no indication that the air is deleterious. "The deaths in the Binck Hole of Calcutta, the depression, headache, etc., in close rooms, are alike due to heat stagnation; the victims of the Black Hole died of

Canada cuts about two million cords of pulp weed annually, about half of which is exported for manu-facture in the United States.



## SCIENTIFIC AMERICAN

#### Engineering

The Bereig Lecenotive.—In our illustrated article of September 20th, 1913, describing the powerful Dissel hottometry, we omitted to state that this very interesting matchine was built by the well-known German hocomotive builders, A. Bereig, one of the oldest and largest locomotive building firms in the world.

A Thessand-feet Dry Bock for New York.—If New York on to be at a serious disideratage, as compared with the ports at Quebec and Boston, it must provide its own dry dock for the secommodation of the largest ocean liners. As noted in these columns, both of the two ports above mentioned are building dry docks capable of accommodating ships 1,000 feet in length, and this in splic of the fact that there is no prospect that ships of this size will call at any other port than New York for many years to come. We are pleased to note that the Bock Commission is planning to build a dock of this size at South Brooklyn.

Excavations as a Cause of Rarthquakes.—We note that in a contemporary journal a correspondent has made the suggestion as to the cause of the recent earthquake shocks in Panama, which is more ingenious than tis aconvincing. He draws attention to the fact that over 200,000,000 cubic yards of material has been removed from the Culebra cut and deposited elsewhere. This, he argues, involved a readjustment of weights on the surface which, taken in connection with such heavy blasts as that of forty tons of dynamic, which was used to destroy the Gambas dile, may have had some prediposing effect on the recent surfaquate shocks.

Size Pavers Economy in Ships.—In the recent James Forrest leature before the Association of Civil Engencers, Alexander Gracie gave particulars showing that increases in size is accompanied by reduction in cost of construction and operation of cargo steamers. A cargo vessed 400 feet long and weighing 3.700 tons will carry vessed 400 feet long and weighing 3.700 tons will carry vessed 400 feet long and weighing 3.700 tons will carry lead to the construction of the cargo 3000 miles on a consumption of 500 tons of coal, Each hundred tons of cargo will require only 71% tons of the 100 tons of cargo will require only 71% tons of ship and 8 tons of fuel.

Ashokan Dam Filling With Water.—The west basin of the Ashokan dam is now filling with water, which is being admitted mainly to prevent a growth of new vegetation, which if it were left dry would quickly cover the basin. Next spring the east beam will be covered with water for the same purpose. Probably no draft will be made upon the west basin supply for another year but in case of a dry season it will be possible to replenish the Croton Lake from the west basin of Ashokan. This means that by the first of next year it will be possible for residents of New York to draw water directly from the Casakill Mountains. The dam will have in the two basins a capacity of 130,000,000,000 gallons of water, sufficient to supply New York city with 500,000,000 gallons daily.

Copper Wire by Electro-depositing.—A process has been devised for the manufacture of copper wire by decir-deposition. The Braze World states that previous strength to accomplish this object have been unaucoessful. The method requires a fine copper wire as a core for making the desired product, and the additional copper is deposited on it while it moves through a tank containing the solution. The fine copper wire is made endless and passed through a regular plating solution containing sulphate of copper and a little sulphurie sold. The wire passes cover grooved rollers operated from outside while passing through the tax After leaving the tank the wire passes through a small riasing tank to remove the solution, and then goes to a reel around which it passes a number of times, returning again to the plating tank. The plating may thus be continued until the required thickness is ob-

Automatic Stop Progress.—It has been announced by the Maryland and Pennaylvania Ralitroad that the Jones automatic train stop and eab signal is to be installed on a length of seven miles on this road, and that during the coming year the road will be equipped for its use over an additional nineteen miles, making twenty-air miles on which this system will be in service. The automatic stop of the Union Switch and Signal Company is being tried on the Delsawan. Lackawanna and Westera nese Newack, N. J. This road is also installing the Federal Signal Company's audible signal for test. The New York Central and Hudson River Raliroad is testing the Induction Signal and Safety Company's system; and the New York, New Haven and Hartford will test the installation of the Union Switch and Signal Company, and snother installation is to be made for test on that road by the International Signal Company. The Fenneylvania Raliroad expects soon to test the induction apparatus of J. P. Planegen, and they have been esperimenting with the Gray-Thurber automatic stop. The Buell automatic irain stop is still under test on the Queen and Crescent Raliroad.

#### Science

The "Terra Nova," the ship of Captain Scott's Antarotic expedition, recently left Cardiff for St. John's, Newfoundland, where she is to re-engage in the whaling and sealing industry, in which she was employed until engaged for service in the Antarotic. Her figure-head has been presented to the City Council of Cardiff.

Remarkable Solar Halos were observed at various places in the central United States on November 1st and in the Atlantic States on November 2nd. In some cases (as at Springfield, Mo., on the 1st, and in southern Virginia on the 2nd) the displays were among the most highly developed combinations of halo phenomena over seen in temperate latitudes, being a ratter close reproduction of the famous "Petersburg phenomenon," seen by the astronomer Lowltz in 1700. The SCIENTYIC AMERICAN hopes to publish a more detailed account of these unusual dupplays in a future issue.

Ashmead Gray Rodgers, for twelve years supremendent of the Carborundum Company's plant at Niagara Falls, died Oetober Zitel, 1913, as the result of injuries sustained through an accident Oetober 5th. Mr. Rodgers was born in Albany, N. Y., in 1872. Previous to his coming to the Carborundum Company as superintendent, he was superintendent of the Eidly Electrical Company at Hartford, Conn. Mr. Rodgers was a member of the American Chomical Society, Engineer' Society of Now York, Chemista' Club, Niagara Cilub, University Club and Country Club of Niagara Falls and other seientific and social organizations.

An International Pharmacepoeta Office, the creation of which has recently been urged by Prof. A Tschirch, of Berne, would have at the outset for its principal task the collection of hierature relating to all the drugs and preparations in the, at present, heterogeneous national pharmacopoeta of the world. Another undertaking would be the standardization of methods of determining the strength and purity of drugs. The project of an international pharmacopoeta has often been discussed at medical and pharmaceutical meetings, but thus far without tangible results. There are now 20 national pharmacopoetas, hesides "extra" pharmacopoetas and other supplementary works; and although collectively they recognize several thousand medicanes, only about 150 are common to them all. The French "Codex" is more extensively used than any other national pharmacopoeta uside its own country. There are, however, several unofficial universal pharmacopoetas which serve to show the comparative strength of parallel preparations in different countries.

Sasweed Burning in Nerway is one of the interesting out-of-the-way industries recently described in the United States consular reports. An enormous amount of seawed is deposited on the coast by the waves in spring, and in some places the weed is out by beatmen. The-wheeled wagons are lossed with the west, slimy weed, which is taken up the beach and spread out like hay to dry. It is thon raked up in heaps and hurned. The sahes are exported to Scotland, where they are used in the manufacture of iodine, and self for 1.3 cents a pound. For the past 45 years seawed ashes have been exported requirely from Sitswaper to, Scotland to the extent of 1,500 tons and upward per annum. This industry is an important source of revonue to the pseuants who are fortunate enough to possess riparana rights, and attempts to purchase such rights from their hereditary owners rarely succeed. For a time the burner hereditary owners rarely succeed. For a time the burner of seawed was prohibited through the influence of the fishermen, who declared that this practice drove the fish way from the coast.

Tunseling the English Channel has been tailed of for generations, and from time to time the sehome seems of the control of the

#### Aeronautics

A Royal Aeronaut.—Archduke Josef Ferdinaud, of Austria, has justified his predicate of "Imperial and Royal Highness" by making 100 balloon voyages.

The Psychology of Air Scouting .- In actual war, both in Tripoli and in the Balkans, aviation accidents were conspicuously few, and this despite the fact that winds were generally high in Tripoli, and the season of the year id the weather extremely unfavorable in the Balkana It is a matter of considerable psychological interest to note that the danger from an enemy's fire so stimulates vigilance that norves are tense with exertion and the mind is relieved from dwelling upon the ordinary dangers of is relieved from dwelling upon me orientary sangests or keeping an aeroplane on an even keel and meeting every gust. In other words, scouting in actual warfare seems to be a splendid cure for nervousness. The aviator must fly with the assurance of a bird, and he does so for fear of the enemy's rifle fire. A striking instance of this psychological phenomenon is the fate of Dr. Jules Constantin, a French aviator in the Bulgarian service. He was mortally wounded in the air during a flight above Tchatalia, as we recorded at the time, but managed to land safely only to die before anyono could reach him. His dead hand still grasped the steering lever, a bullet-hole was in his breast. The feeling of detachment from the ground at 3,500 feet probably dispels intense fear nificant that, because everything is hea lt 18 se everything is heard so clearly in the air, even to such trivial noises as the barking of dogs and the cackling of hens, the roar of battle is exaggerated and seems more intense and tremendous than it really is

Recent Aeroplane Patents.-A patent, No. 1,074,007, has been issued to Frederic Mylius of Atlanta, for an aeroplane which has a transverse carrier plane whose upper surface is concave, and rearrandly con-verging guide planes which are secured at their forward ends to the carrier plane and have their upper sur-face converted educations. concaved adjacent their forward ends and vexed adjacent their roar ends. In a patent, No. 1,074,-063, to Harry A Orne of Wesley Heights, D. C. is shown a vertical steering plane with a curved slot and anown a vertice ascerning plane shotted to receive the verti-cal plane and movable from side to side, a rib of the horizontal plane working in the curved slot of the steering plane. Ralph P. Fox of Fort Hancock, N. J., has secured a patent, No. 1,073,977, for a safety support for flying machines in which is provided a main support-ing surface, an auxiliary balancing and supporting surface in front, rear and at opposite sides of the machine and beyond the main supporting surface, the balancing surfaces being of circular form in plan and elliptical form in vertical section and presenting opposed upper and lower convex resisting surfaces. Cleve T Shaffer of San Francisco, Cal., in a patent, No 1,071,101, provides an apparatus in which an aeroplane is supported and propelled along a track and is flexibly connected with the track, means being provided for controlling the flexible connections for regulating the universal inovement of the aeroplane relative to the supporting track.

Armored Acroplanes in Franco.—It appears that the German war department took the lead in protecting acroplanes by armor plating, and after this the idea was taken up in France, where several armored flyers were to be seen at the last Prans show. However, the French army did not go extensively into the matter before attention was called to it by two events, one bong the experiments made at the Touloin arsenal in firing upon acroplanes has tyear, and the second the results of the first war in the Balkans. It was then resognized that all acroplanes were vulnerable when flying below 4,000 feet, and with the present system of observing, a machine needs to fly as low as 2,000 to 2,500 tot in order to see the state of affairs on the ground. It would thus be exposed to artillery and infantly fire. Two solutions were presented for protecting acrophones, first to armor plate for the men, mutor and devices, or only to protect the acroplane guiss and in this case keep the flight very high so as to prevent being hit. Here, the observer would be at full length and observe hy acts of lenses. The French army decaded to adopt the ties doubton, that is, good provent being hit. Here, the observer would be at full length and observe high the way armored accoplance will be made up of the following types of acroplane: First, armored single-place flyers for articlery and eavalry secuting and for short secuting trips at the speed of 70 miles an hour. Second, the Eta-Major will make use of two-place scutting acroplanes, also armored, and used for 60 miles at hour speeds. The third kind is an armored two-place with untralleuses and automate genes, intended for pursuing the ensemble of 50 miles and hour, designed for speeds of 70 miles and hour speeds of 60 miles and hour, designed for speeds work.

# A Radical Improvement in Cabling

## Eliminating the Siphon Recorder

By Herbert T. Wade

TellaT improved methods of working submarine clouds are desirable may be appreciated from a statement authoritatively made that the number of cable messures sent throughout the world practically doubles itself every ten years, and the fact that recent changes of policy whereby deferred and other messages or cable letters are taken at reduced rates, are naturally leading to an increased use of the submarine telegraph in definition to the purely normal growth. A new method has been developed by which Morae signals may be sent through long submarine cables with some approach to the facility edgoed in the transmission of the familiar dots and dashes on overland circular. This new system promises to produce many radical changes in handling the ever-crowing traffic now car-

ried over the catalon of the world.

By the new method re-transmission at the cable or land ends is obviated, the shipon recorder used since the days of Lord Kelvin gives place to an ordinary Morse recorder or sounder, with a corresponding increase of accuracy in transmission and saving of line in deciphering the received message, and a number of short cables can be linked up for direct working, withe long

land lines can be connected directly to a cable system, all messages being automatically relayed to practically any distance. The seeding of signals over lost cables can be effected by an ordinary teiegrapher with a signal Morse key lines of the double key of manual cable working, while a Wheatstone or other aimiliar automatic transmitter may be introduced in case increased speed is desired. Consequently the new method establess uniformity of operation between land and submarthe lines and makes possible the fullest and most rapid interchange of traffic

The invention resulting in these innovations came as the result of many years of experimentation on the part of John (fort of Hove, Smeez, England, chief electrician and consulting endoner of the Commercial Cable Company. In addition to daily use between London and New York special demonstrations have been made of direct communication between San Francisco and London, as well as between the latter city and Montreat, Toronto, Winnipez, Victoria, and Bumfield, P., C., on the count of Vancouver. Although the new method is one of extrome simplicity and requires no other piparatios or instruments than may be found at

any cable terminal or testing station, it affords the solution of a problem that has held the attention of cable electricians for many years.

Hitherto even using the most sensitive instruments in has not been possible with a long cable so to interrept the electric current as to form signal impulses or greater or less length such as the dash and the det, but it has been found necessary to reverse the current and distinguish the two eleneats of the signals by its direction. Thus in ordinary cable working substace, indicated in the Morse code by a dot, would be signified by a + impulse, while t, represented by a dash, would be a — impulse, the galvamenter or siphon recorder at the receiving station indicating such impulses by an appropriate deflection of mirror or moving cell in one direction or the other. This of course would be in response to the signals of the senging operator made by depressing one or the other. The of course of the transmitting key, depending whether he wished to Join the positive pole of the battery to the entile and the negative to the earth or vice evers.

As in the case of the land telegraph it is possible to send two messages in opposite directions over a sub-



Special cabinets containing the artificial cables used in duplex working.

These calinets in a room maintained at constant temperature contain inductive resistances that reproduce the eletrical properties of a cable. The open calinet shows those used with the cable from New York to the Anova Other calinets contain slittlar resistances for the various cables tendingly at the Par Rockshaws station.



John Gott of Hove, Sussex, England, chief electrician of the Commercial Cable Company.

inventor of a successful method for transmitting signals of the Morse code, or dots and dashes, over long submarine culter, b) the use of reversed currents, which secures uniformity of working with land lines and other connections, and which have been demonstrated by direct communication as far as between London and Nan Prancisco



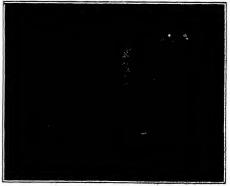
shore station at Far Rockaway.

The three cables to the left in the background are the subterranean land lines to New York city. Adjoining are the submarine cables that pass out through the sand dunes to the bed of the Atlantic Oevan. The operator is testing consections on the frame that carries switches, lightning arresters, terminals, and distributing system.



Sending dots and dashes through a cable by the Gott method.

The operator is using an ordinary Morse key and a sounder is at his ear. The coil at the right is the special transformer and the polarized relay is contained in the cylindrical case between it and the Rey. Notice that all the instruments for use by the new method are of familiar to.



Operating room at Broad Street in New York city.

From this room in a building near Wall Street and at the very heart of the New York financial district, direct communication is maintained with London and the continuated Burope. The messages sent often involve millions of dollars failty. One cable is reserved exclusively for Nicck Exchange business.

Salar Salar William Control

## SCIENTIFIC AMERICAN

menting civile. It has been claimed that when a cable is weeked under straplex conditions (i. e., sending me-sages in one direction only) the speed of working slightly higher than that at which messages are sent in slightly higher than that at which messages are sent in either direction when the earble is worked under daplex conditions. Nevertheless it is a fact that duplex work-ing has more than doubled the carrying capacity of the cable, and it is now the approved method for all

s to divide and flow the current par o connecting with A, the cabel, and b an artificial cubic having similar electrical properties as regards resistance, capacity, etc., to A. At V is a galvanemeter or sphon recorder bridged across A and b, the entire bridge being balanced so that there is no difference of poten-tial due to the battery at L and no disturbance can be caused by opening or closing the key at d in sending a same, of course, takes place at the original station Hitherto successful long distance cable working has involved the use of a reversing key to send two element signals by changing the direction of the cutrent. Direct Morse, or dots and dashes, has never been found to work with success much over 500 miles, though it has been realized that the best results in speed and clear-ness could be obtained if it were possible to reverse



Operating room in new shore station at Far Rockaway, N. Y.-A model cable terminal



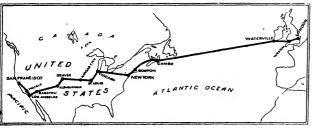
Ordinary method of transmitting cable dispatches with double key and siplion recorder.

atte relay is shown in the background

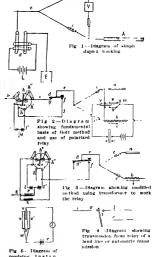
All traffic of this company to and from New York passes through the instruments here. CANADA UNITED STATES ATLANTIC OCEAN

Route of direct transmission of telegraphic signals from London to the Pacific Ocean.

ots and dashes have been sent direct across an ocean and a continent, a distance of 6,477 miles. The long Atlantic cable from Canno to Waterville is worked by the Gott system as well as the cable from Ireland to Great Britain



Map showing the route of the direct transmission of Morse signals from San Francisco to Londo Idetance, San Francisco to London, 7,847 miles. Points where the message was automatically relayed are indicated



--/vwwwwww.---

og instru and circuit



Section of tape with signals registered by siphen recorder and translation

Street London E c 4 5 6 0 311

Boord of a cable message sent across the Atlantic by the Gott method made on a paper strip of an ordinary Morse ink-register.

Note how clearly the dots and dashes came through.

busy lines, and of course to it the new Gott method may be readily applied. This is shown in the accompany-ing diagram (Fig. 1), which to one familiar with elec-tricity will sit once suggest the Wheatstone bridge. Here I is the bittery, \$a sending key or pole changing switch connecting will either pole of the battery with the online and grounding the opposite pole. Through a the

. 75.

signal. But at the opposite end of the line where the agnal. But at the opposite end of the line where the same arrangement prevails an electrical impulse or sig-nal received will have the effect of adding to or sub-tracting from the potential on the cable side of the bridge and consequently act to destroy the balance of potential, causing the moving coll of the galvanometer or siphon recorder to be deflected appropriately. The the currents after each signal and then transform the resulting impulses into regular Morse. Various sug-gestions have been made for mechanical and other devices to effect this desired reversal of current in each successive impulse, but it has remained for Mr Gott to work out the problem practically and electrically so that an ordinary Morse operator can send the conven-

## SCIENTIFIC AMERICAN

tional signals with the usual type of key, with the result that so far as the sender is concerned there are substituted the impulse signals by intervals of dots and dashes, while at the same time all of the advantages involved in the reversal of current for each successive stream.

In its essence Mr. Gott's method is exceedingly sim ple. The change in direction of the current is offered after each signal by the use of a polarized relay through which the cable is discharged and the path of the current reversed for the next sending signal. polarized relay may be of any type of suitable sensi tiveness and resistance such as is employed on land thues. It consists of a permanent horseshoe magnet with one of its poles divided and formed into pole pieces around which are fitted colls of fine copper wire through which the current may pass. Between these pole pieces is poised a soft iron needle or tongue, free to move, but normally held at rest in a neutral position by the fact that it is attracted equally by both Now, if a current passes through the coils it will strengthen the magnetism in one of the Iwo pole pieces, depending of course upon the direction of its flow, causing the arm or tongue to be attracted to one side or the other. In so moving it comes into contact with one or the other of two stops and completes a local circuit where the direction of the current depends upon the direction of the current flowing through the colls of the relay. The application of the polarized relay in the Gott method will appear on reference to the ac conpanying diagram (Fig. 2), which shows a cable ar-ranged for dupiex working. The cable itself is shown at a and the balaucing or nertificial cable having the same resistance and expucity required in duplex work ing is placed at b with its unconnected end grounded Between the real and the artificial cubic is inserted the receiving instrument 1', and then after connecting with the condensers at c and c' the circuits unite at c, where the transmitting key d is placed. So far there is no variation from ordinary duplex working. The key however is arranged so as to connect  $\epsilon$  either with g, as when at rest or normal, or when depressed at f with f, as when sending a signal. Both of these connections as when sending a signal. lead to the polarized relay h and by tracing them out on the diagram the action will be apparent. Proon the diagram the section will be alpharent. Pressing down the key at f to make a dot or a dash the cable is put late connection with j, which is turn is connected with the movable torque h, and through it with one of the stope K, each of which is connected with an opposite pole of the spill batter; at I and T with an earli connection at M Consequently depressing the key would charge the cable by connecting the conders with the battery, and the polarity of the charge of current would depend upon which of the stops at h'the movable tongue h" was in contact with. Now permitting the key to return to its normal position establishing contact at  $\sigma$  causes the cable to discharge through the polarized relay and the current flowing through the culls would send the moving tongue or arm from one stop ut h' to the opposite so that where the + pole of the battery had been connected to the line, at the time of sending the next impulse or signal it at the time of sending the lest mappins or signal it would be the — pole. Thus every time the key is depressed the cuble and condensor are charged with the discharge of the line between successive unit inpulse signals goes on continuously, no two successive signals being of the same polarity. As the energy of the discharge from the cable is considerable, the resistance of the coils of the polarized relay does not figure and the cable is restored to a neutral condition so that good and repid signaling is possible

A modification in the sending method involves the ase of a transformer in connection with the polarized relay as shown in a second diagram (Fig. 3) and in the photograph of the operator and instruments. In the diagram the condenser and cubic are enritled directly at fy after each signal and while the key be open. A split battery is provided as before which is earthed at # through the primary cell P of the transformer. The coils of the polarized relay are in connection with the secondary of the transformer 8 and the centure point of the key f is connected through the movible tongue & with the stops that in turn are connected with the split or double battery. The function of the transformer is to induce in the secondary cell, which is connected with the coils of the relay, a current that will send the tongue over against the opposite stop so that when the key is next depressed the direction of the battery current to the line will be reversed from that of the previous impulse or stomal. These reversals take back in the relay is equipare sequence so that no two successive currents sent are of the same polarity. An advantage claimed for this method is that on making contact with the key to charge the called the battery content.

key the tongue of the relay of a land line is very simple on is shown in the diagram (Fig. 4), where T takes the place of the key of Automatic transmission is also possible, using the punched paper and the familiar Whealstone transmitter employed in high speed teiggraphs. The Wheatstone transmitter takes the place of the key, the two upper contacts of the vibrating contact arms being used for this purpose and the revent proburtsed relay embryed as with the hand key.

To understand the receiving arstem the diagram (Fig. 5) should be examined in connection with that of the sending station. At V, where the sliphon recorder continerily is placed, a similar instrument, but one provised with a contact making tongue attached to the moving ceil, is used. This tongue or arm makes contact with either v or v', depending upon the pointify of the current coming through the cable. These plates in the instrument are insuitated at v, but are connected at W and are in circuit with the local battery r, and a sounder or recorder at Z, which however may be a reisy or any desdred interment. While the contact place at V will move from one side to the other depending upon the polarity of the arriving current, the effect on the local circuit will be the same in either case and the dot or dash is sounded or recorded just as if it were but a simple break and make of the circuit as in Ordany Morse working.

Now from this outline description it will be evident that these various arrangement can be combined practically indefinitely. Relays from land lines can be used to work sections of ocean cables, and the signals from one section may be transmitted to the next and finity to a relay working a land system of practically any length. Thus when the operator at San Francisco was communicating direct with London. his message was



Simple method of laying out a pentagram.

relayed across the United States by nine relays work ing over us many sections into the cable office in New receiving relay automatically gave message to the Goit arrangement and the electrical sigmessage to the doil arrangement and the electrical sig-mal impulses were sent on their 1,000 mile journey to Canso, Nova Scotla, there to be received and auto-matically sent on the long section of 2,565 miles across the Atlantic to Weston Super Mare, England, where a similar retransmission through 146 miles of subter-ranean line took place to London and the message from the Pacific Coast was heard in that city with the familiar click as If it were but from Manch Is a point has now been reached where no fimit can be upon the interchange of traffic up to the capacity of the individual lines and cables making up a system Scientifically the problem of Morse signals and reversed currents has been solved, but problems of traffic remain A cable represents a costly investment and its use must be planned for a maximum of efficiency and a minimum of idleness whether it be for tack of bud ness or waiting time to connect directly two distant The new method affords much greater facility of working, and while it will not phenomenally i the actual speed of transmission yet it will, as in fact the section speed of transmission yet it will, as in nect it has done, make submarine ielegraphy more effective, accurate and uniform. Indeed with this and other inventions and instruments it may be said that cable working to-day is in a transitional period toward even greater efficiency, and that the day of the abandonm of the submarine telegraph with its lines of copper, guttapercha and steel armor for radio-com

#### International Exposition of Safety and Sanitation

R AILROADS covering nearly a billion locomotive miles are in the competition for the first award of the E II. Harriman Memorial Medais, which will be made at the First International Expedition of Safety and Sanitation, to be held in New York city, December 11th to 20th, under the auspices of the American Museum of Safety.

The Jury of Award consists of Jane Addams, Vincent Astor, Mrs. August Belmont, Surgeon-Genéral Emperilles, Mache I. Boardman, George B. Cortelyou, John H. Finley, Irving Fisher, Elbert H. Gary, Prof. F. R. Hutton, Joseph Johnson, J. B. McCall, president of the National Electric Light Association; Dr. William E. Nichols, John H. Patterson, F. E. Rogers, B. B. Thayer, Littlen Wald, W. T. Wilson.

The Safety Exposition will be the occasion of the annual meeting and dinner of the American Museum of Safety which will be held at the Waldorf-Astoria on the evening of December 12th. One of the speakers will be President Aribur T. Hadley of Yale. All of the awards will be made on this occasion, including the Harriman Memorial Mednis, the Safety Exposition Mednis, and the annual medias of the American Museum of Safety, consisting of the Schretten Museum of Safety, consisting of the Schretten American, the Travelers, the Semmen and Rathenau Mednis.

#### To Strike the Pentagram By John P. Robinson

W HILE there are various methods of striking the five-point star, the following one worked out partitle by by chance by the writer, while demonstrating certain attributes of Encilis' forty-seventh problem, is very simple and direct. Moreover, it offers an easy method of striking the star on a large scale, say for laying out a lawn bed, or other and larger applications, decorating, etc. It offers interesting suggestions as to the 3, 4, 5, and 8 reintions, as one will agree upon working it out. All that is needed is a measuring sitch, struck into 3, 4, 5, and 8 spaces. Try it at first with a common inched ruler.

Frave the base line, 1—2, eight inclew long, marking off the center at four inches. At the center, ertike a perpendicular time of six inches, three above, three ledow the horizontal line. You now have a cross, two arms having four-lineh, and two three-lineh dimensions. Call the top of the perpendicular No. 5, and the best of the control of the perpendicular No. 5, and the best of the control of the perpendicular No. 6.

Now, according to Euclid's problem, if 7—2 is four tuches, and 7—3 three inches, 2—3 would be five inches, which is found to be the case. But the base line 1—2 is going to form the "peaks" of our five-point star, and these are just eight inches aparl 80 now put your ruler on 2 and let its five-inch mark

So now put your ruler on 2 and let its five-inch marks plast touch No. 3, draw a stratch line, seeinning at 2, 2 passing the polut 3, and continue three inches more: this will make the 1the just eight inches long. Now place ruler out 1 and 3, and draw an eight-inch line also. Call the terminals of these more lines, 5 and 5 praw a set of the 1 place from 5 to 4, one from 4 to 6, and you have the star.

The simplicity of this method should commend itself to those wishing to strike large star diagrams. We two common chalk times for bose and perpendicular, a rough pole as a measuring unit, you can easily strike a star inving its base of two pulms eight times as long as the pole. The method is direct, much mure so than striking from five points within a circle, especially when there is no easy method of quickly obtaining the 72-degree spatching of the circle except by trying five times arround.

## Is the Whale Disappearing?

This fact that whate is disappearing it pointed to ut by M. Ed. Perrier, head of the Paris Natural Instory Misseum Several species will probably soon be tost on account of the very active hunting being carried on a present. No less than thirty Notwegtan companies are engaged in this work off the western coast of Arfica, and on the castern coast in the Mozambipur region. The danger is as great from English enterprises. This account of the future extinction of the whale led the Anderbry to pass resolutions recommending the interest of the government in the matter and cailing for an international commission.

## The Current Supplement

THIS week's issue of the Schettic Astraca Schetting and the Schetting complete tables of the arrowed ships of our Navy, showing their principal dimension, dute of hunch, number of rgms, speed, etc. The tables are prefaced by some introductory remarks, which we owe to the pen of a naval expert.—Prof. Charles L. Paranon, Chief of the Division of Mineral Technology, Bureau of Mines, reports in detail on the radium resources of this country, which seems destined to become one of the principal producers of that ultra-practions material.—John J. 16s gives a brief description of the latest military type Borel monopian.—Dr. Geoffrey Martin contributes an article on the production of prycohoric alloys used in gas, eigarette lighters, etc.—Irving C. Allen writes on "Hency Oli & Fuel for Internal Combustion Engines".—P. S. Millar, in an article on "Some buston Engines".—P. S. Millar, in an article on "Some buston Engines".—P. S. Millar, in an article on "Some buston Engines".—P. S. Millar, in an article demonstrations of lighting effects produced different sources under different sources under different conventions.

## SCIENTIFIC AMERICAN

## Correspondence

[The editors are not responsible for state ade in the correspondence column. Anonymous com-unications cannot be considered, but the names of correspondents will be withheld when so desired.]

#### The Abuse of Carbon Copies To the Editor of the SCIENTIFIC AMERICAN:

Not the least of the advantages which the modern nethod of typewriting offers over the old process of writing by hand, is the great case with which a num-ber of exact copies of the matter can be prepared at one operation. No one could possibly find fault with the common practice of this method, so long as it is not abused. One or two carbou copies can, with proper precautions, be made almost as legible as the original. Furthermore, if an additional number of copies are filed for one's own use in an emergency, in many cases the requirement of ready legibility may legitimately be d to fall somewhat into the background. But allowed to fall somewhat into the neekground. But the practice, unfortunately somewhat widespread, of sending out in the regular course of business, docu-ments the reading of which is an excessively severe task on the eyes, cannot be too strongly condemued. Will you permit me, through your columns, to put on record a protest against this practice? There is an easy remedy against it. Return all such defective carbons to the sender with the request for a readable copy. A glance at the matter received will suffice to determine whether the importance of the document is such as to induce the recipient to make an exception to his rule, but I venture to predict that the occasion will not frequently arise A person who has anything of value to municate will in most cases have the judgment and good taste to present it in respectable garb.

S. M. Gainte (We take pleasure in publishing Mr. Gridley's letter As editors, we have only too frequent occasion to make observations similar to his, and we can fully indorse him on every point.—Entros.]

#### An Aerial Maneuver

To the Editor of the Scientific American

The San Fernando Vailey is a level plain, oblong in shape, perhaps 10 miles wide by 30 miles from southeast to northwest, situated near Los Augele from southeast to northwest, situated near Los Auscies and almost surrounded by high hills on the south and the Sierra Madre Mountains on the north, inck of which is the Mojave desert. A peculiarity of this country is the almost total absence of what are known as turkey bursards. On September 50th heat, at about 4 P. M., I noticed an immeuse flock of buzzarde circling. around over the extreme south side of the valley, near the Cahmuga Pass, which leads into the city. contained probably five hundred birds, and most of them, if not all, were turning from right to left and mounting higher at every round. As the column mounted higher it was continually augmented by hirds coming from every direction, singly, in pairs, and flocks ing from every direction, one shape, in pairs, and noces of various numbers to perhaps twenty, which promptly took their places in the column, which finally reached to a considerable height, probably three thousand feet. As soon as this height was attained the birds "volplaned" to the southwest, the nearest point to the coast, about 20 miles. This performance continued until the last bird was sailing away toward the sea. The above out did not last longer than 30 minutes, but there were thousands of birds that left in the flight. They were probably migrating, but the query is. Where did they come from, and how did they know the date and place to meet and make the start?

Lankesshire, Cal.

A Mr. Frank Young was present and saw the above.

and will affect to the truth of the statemer

## A Plea for the Fox and His Fellows

To the Editor of the Scientific American:

You have been exceedingly generous in granting space for reference to the need of a humane trap. All lovers of animals must appreciate this. The Massachusetts Society for the Prevention of Cruelty to Ahimals certainly does. We have been doing what we could, and some success, to secure legislation against the tashioned steel trap, with its possibilities of torture for the victim caught. The question has many sides to it, as some of your correspondents have discovered.

as some or your correspondents nave discovered.

For the benefit of one of them I would like to call
attention to John F. Draughon's "Fur Searing Animals
the Farupar's Friends." He says, in substance, the
United States Department of Agriculture states that
eighty, million dollars' worth of damage is done each
year to crops and fruit and forest trees by field mice, ground squirrels, moles, pocket gophers, and grasshop-pers, and that these pests constitute from eighty to ninety per cent of the food of foxes and other fur-bearimals, such as wolves, lynzes, badgers, races, skunks, minks, wessels, and shrews.

warning, therefore, is given by the Department that unless a check is put upon the killing of foxes, sknuks, is, and the like, the farmer will continually find it harder to reap the reward of his toll. Even if ocsionally a chicken is taken from the hen-yard by for or skunk, the assurance is given that the farmer might better far pay this toll than kill the robber. Mr. Draughon is regarded in Tennessee as an authority on d in Tennessee as an anthority on Francis H. Rowley, President,

Boston, Mass.

## The Ten Most Needed Inventions

To the Editor of the SCIENTIFIC AMERICAN:

A correspondent asks, What are the ten most needed inventions? Allow me to suggest the ten following: 1. A practical substitute for lead for use in secondary or so-called storage batteries. 2 Automatic stoking device, which will do the work as well as human hands 3. Substitute for the wasteful wooden tie used on rull-4. Reduction gear and reversing device steam turbines. 5. A commercially practical method of fixing atmospheric nitrogen. 6. Some method of suspension or spring wheel which will do away with the necessity of using pneumatic tires on motor necessity or using pneumatic tires on motor cars. 7. A substitute for gasolino for use in internal combustion engines, 8. An automatic stabilizer for aeropianes, 9. Method for delivering the energy in coal directly as electricity with the interposition of steam engine and to. 10. The discovery of the secret of the firefly dyna and its application to the production of artificiat light.

#### The Most Needed Inventions

To the Editor of the SCIENTIFIC AMERICAN Noting a recent inquiry in your columns the writer suggests that an attempt to limit the most needed inventions to ten would appear to be absurd. One can think of more than that many offnand, as for instance:

- 1. An electric light as efficient as the molor A storage battery as cheap as dry cells, light, efficient, and foolproof.
- A new product which will utilize or require the use of vast quantities of chlorine to advantage
- 4. A wireless telephone which will cost no more and use no more power than the simple sets now used on
- short inter-communicating lines.
  5. A glass or substitute therefor which will withstand strains without breaking, without losing the usual transparency.
- 6. An economical crude oil engine light enough and adapted for automobiles and similar service
  7. Cheap substitutes for leather and rubber which
- have the properties of the natural material and which can be n
- can be mude on a large scale at low cost.

  8 A lifeboat which will not sink or capsize and which can be lanuched safely in a heavy sea 9 Means to prevent railroad wrecks which will,
- within human error, prevent such wrecks entirely 10. Real cures for consumution and caucer.
- 11. A detector for radio communication which with out sacrificing the sensitiveness, rigidity, and practicability of present long distance types, will still be of itself, or in conjunction with a positive rapid relay mechanism, capable of automatically transmitting the received energy into lond or visible signals under all

conditions met in practice.

And so the list might be continued. Many of the items are of course already receiving attention with en-couraging results; certainly we shall see at least some of these problems solved and perfected. It would be ng to note the individual opinions of s hundred readers engaged in the various arts and indus tries. Then, perhaps, it may please at the ten most urgent. Public PHILIP E. EDELMAN.

## Just What is a Cyclecar?

To the Editor of the SCHENTIFIC AMERICAN:

This is in reference to the article on Cyclecars, appearing on page 205 of your issue of October 4th. After reading the statements contained in this article in regard to the American cyclecar, the question naturally gard to the American exceeding the method market, "Where does the cyclocar stop, and the automobile begin?" In other words, what is the distinction? Why is the vehicle shown, for instance, at the er left hand corner of the above page any more upper sett finant corner of the move page any more a "development of the motorcycle" than it is a development of the automobile? It would be a good idea if you would publish a definition of "cyclecar" for the mefit of your reader Washington, D. C.

[Abroad, where cyclecars first saw the light of day, [Abroad, where cycleaers first saw the light of day, they were a development of the motorcycle, or rather from the motorcycle; they consisted, and still largely consist, essentially of motorcycle parts, and for a long time the Royal Automobile Club was hard put to 1 to find a class in which to place them. At leasth it was determined by the International Federation of Motorcycle Clubs to place cycloaers in two classes, both

ses to consist of vehicles having either three or four wheels and for one or two passengers. The targer class includes vehicles with a maximum weight of 784 pounds and a maximum piston displacement of 1,100 cubic centimeters, the tires to mensore 2 % luches in section; the smaller class to have a minimum weight of 330 pounds and a maximum weight of 660 pounds with a maximum piston displacement of 750 cubic centimeters, with three measuring 2.1/16 linches in section, att vehicles must be equipped with a clutch and change speed gear. Hence, the foreign cyclecar conforms largety to these simple specifications. In America, manufacturers of so-called evelours have given no intimution of being bound by even these figures, and we find vehicles exceeding both weight and engine capacity unceremoidonsity termed cyclecars despite the fact that the so for as the L. F. M. C. definition is concerned at least—they not the 1.F. at a meanitude of concerning at easts—they are little more than small cellflows of targe automobiles, many of the attributes of which they retule. Strictly speaking, they are not extensive as was made plain in the article to which you refer, they are developments of the automobile rather than of the motorcycle. gh the fact remains that their bispiration spring from the two-wheeled vehicle --- Epitor !

## Expert Report on the Last Zeppelin Disaster

In the issue of November 1st of the Scientific American the writer discussed the "Lessons of the Zeppelin Airship '1, 11'" — It is interesting to compare with the observations then made, the expert report of Dr Eck ener on the probable cause of the explosion of the lilflated craft. From this report the following excerpts are

"There can be no doubt that at the moment of catching fire the cruft was practically enveloped in a layer of explosive anti-hydrogen mixture and that these gases were ignited in the forward engine on to a spark of the like In the engine our there ought to be no possibility of any explosive mixture of gases being present

"Ir Eckener further concludes that the entostrophe of the "L 11" was brought on by the peculiarities of the construction of the vessel. In point of fact the new type of the "L. II" was the subject of serious disenssions between Count Zeppelln and his experts, as well as those of the may, and it may be freely stated that Count Zeppelin ilid not regard this type as helug quite as safe as his earlier constructions, and set out moon the building of the ship with a certain amount of esitation, nithough the design of the ship was in other respects very excellent

respects very excellent
"Wherein lay the new features of the "L 11" as compared with the older types? Principally in respect to
three points." A gaingway was placed hislds the ship,
the cars were drawn up close to the balbon, and the forward engine car carrying two motors was provided with a large wind screen to protect the passengers from the rush of air. The question is. Which of these three factors caused the explosive gas mixture to enter into the engine car?

"As regards the first point, placing the gaugents within the balloon, this in itself is not a serious matter It is true that a temporary accumulation of gas at the top of the gangway may occur at the time of blowing off gas, but gas so escribing would not thereby be brought

"More danger must be seen in the second feature, the closer approximation of the cur to the body of the

"But unquestionably the most fatal error to the con struction was the provision of the screeps. A dend struction was the provision of the screens A decid squee is formed beidnd these, in which air and hydrogen may accumulate. The entastrophe of the "L tt" can therefore be explained only as follows.

"The alrelity tiding rapidly gave off a large quantity

of rag. An explosive mixture was drawn into the for ward engine car and was ignifed by the flame of the carbureter or some other shullin cause Once this ource of danger is realized, the remedy for it is not far to seek. Proviston must once more be made as on former occasions for good ventilation over the en-regardless of the comfort of the passengers. If t If this is properly attended to, future air-ships will be as safe from explosion as former models. Perhaps it will be as well to go a step further and to cause the escaping gases to leave the balloon at a point where they are not dangerous to If'

If the realer will refer back to article noted above, he will find that in att essentials this agrees with the expert upinton here quoted

## A Good Furniture Polish

A GOOD furniture polish, whilch is black and which will remain soft in the container, is made as follows: Three ounces of wax, two ounces of pearlash and six ounces of water are heated together, and when thoroughly mixed add four ounces of bolled oil and five ounces of turpentine. This should be poured in wide mouth containers, where it will keep indefinitely.

# Electric Signal Method of Firing Navy Boilers

## Automatic Indicator Tells When to Stoke the Furnaces and Amount of the Charge

THE Nichausse electrical signal method for furnace firing has proved such a success that the French navy is now adopting it as standard upon the buttle ships of the fleet which are operating by steam turbines, and it is also coming tuto use upon many oth

In the old method ing the overseer in the fur nace-room calls out the time and order for stoking the furnices, and this is likely to make him neglect other duties such as ob-serving the water level, cont conveying, ush empty

In the simplest form of the electrical apparatus the operation is as follows. An automatic signal sender is placed at the control hench of the engine-room and at the chief engineer's hand This officer pos-

number of furnace charges per hour neces the different rates of combination per square foot of grate surface, and in consequence the different rates of steam production. For instance, should be need 15 combustion, he sets the automatic signal sender for this figure, so that signals are sent accordingly to the fur-incernom. The signal sender 1 is a simple device currying a clockwork driven shaft with sets of disk-Each disk has two projecting coms which work mon lever arms on the base and the com driver its lever arm so as to make an electric contact, there being thus two electric contacts per revolution of

a disk. Our engraving shows four such disks, also an outer cam disk for ringing un electric hell. The engineer sets the speed by turning a numbered disk to 15 or other number of charges per hour which acts on the mechanism the apparatus gives the needed signals to all four furnaces at the proper rate, without any more attention, by the use of a luminous indicular board. The latter is placed in the furnace quarters and consists of four luminous panels C mounted in an iron box, each panel being connected by wires to one of the disks of the sender.
As disk No. 2 revolves, for instance, it makes an electric contact so us to light up the lamps be

hind panel No 2, thus indicating "Clurge 5 shovelfuls ning panet No 2, times indicating "timings of smoothus-into furnases No 2," and the electric bell rings at the same time. In the same way panels Nos 3, 4, etc., are operated to turn, and time all four furnaces are stoked in the proper order. The number of slowel-tuls per charge is set once for all to 4, 5, 6, etc., by turning a button placed beside the number on luminous board, and should there be differences in the grate surfaces these can be compensated in this way. Pilot lamps in the engineer's post enable him to see that all is working properly The signal sender is all Inclosed and can be set at once from the outside to

any rate that the engineer may require for a given period of time, simply by turning the numbered disk so us to accelerate or diminist the rate of stoking.

since the use of multi-tubu int bollers, which are very scusifive to sudden changes in firing, the Navy Department recognized the necessity of using a methodical stoking as besides giving a better steld. It partly preven the volumes of smoke which show the presence of the versel to the enemy. On board the "Ernesi Renan," which possesses 42 hollers and 8 stoking passages, the old method of conducting the furnace firing by clock, which was the only means then used, became almost useless fact, the chief engineer in the engine-room could only com-municate by speaking tu be with the furnace functors, and this resulted in errors of

transmission of the number of charges to be adopted and hence much irregularity in operation. Then the Nichusse system was put in, and it rendered such good service that the personnel on board pronounced unanimously in its favor, so that it was retained in this ves-



A-The signal sender. set and soon afterward installed also upon the "Patrie

and at a later date upon other battleships. Each of the furnace passages is provided with one luminous indicator, and the engineer can turn his disk so as to instantity themse the second of the contraction. instantly change the rate of combustion of all the fursides, the system allowed of eliminating 24 stokers, was shown during the first tests, and moreover the greater regularity of combustion resulted in a lessenline of contamplion, so that now this was only 707

sion of sufely-valve lifting almost entirely, of bringing



C-Luminous indicator in the furnace-re-

over of water, and of flames from the smokestack which are an inevitable consequence of bad firing, were noticed in this case. Upon the appearance of 23,000-ton battleships it was feared for a time that the maneuvers would not be as rapidly carried out with steam turbines as upon engine equipped vessels, and a remedy was sought in making

equipped vessels, and a remeay was sought in making in closer connection between bullers and turbines than before, especially as concerns the reverse drive. This led to the use of a somewhat more elaborate form of apparatus which we filustrate, the object being to send more complete signals to the furnace quarters. The same signal sequence is once an bestore, and to it is access an "order transmitter" B with three handles working upon numbers so as to give the following indications upon luminous panels; first the indications as to speed of the engines (five signals), "speed to be accelerated,"
"stop," "forward," "re

verse," and "speed to be diminished;" second, combustion figures showing the tion rate per sq meter of grate surface and per hour from 40 up to 180 kilogrammes if need be; third, the number of shovelfuls for the furusce charging. This will be clearly seen upon the two luminous boards, the first top range the five spe als just named, while the lower range shows the bustion figures 40 to An electric bell is also

used. Above 80 the num-

ber is obtained by using two figures and adding them, for simplicity. The second luminous board E is a modification of the first-mentioned one, and indicates "charge furnace Nos. I, II, etc., with 3, 4, 5 or 6 shovelfuls," as the case may be. All these indications are indispensable, for it is not enough to use the first-mentioned device alone for the furnace firing in this latter case, for even though the stokers obey the firing signals, they only perceive after a certain time that the firing rate is becoming more rapid or slowing up, and it is preferable to call their attention at once to changes which are being made in the firing rates, so that from the

ilirst moment they can look after the fires and vary the draught either by working at the ash pit or by attending to blowers or air compressors. The chlof engine therefore operates the rate The calor engineer therefore operates the rate disk of the signal sender and also the three handles of the second device or "order transmit-ter." The three dials here correspond respectively to combustion figures (40 to 80, etc.); second speed figures, also stop or reverse; third, number of shovelfuls per furnace charge. As to the last, it is seen that the engineer can vary the number of shovelfuls at any time, while in the last, it is seen that the engineer can vary the

the three mandes of the order transmitter, the first two work together with the first luminous board, while the third (shovelfuls) works upon the lower range of figures in the second board (8, 4, 5, 6). The clockwork signal senders work with the upper range of the second board to show the numbers for the furnaces (I, II, etc.), and to ring the electric bell, as before. With the present simple and effective apparatus no false maneuver can be made, and each change in operating the vessel is made to give the corresponding change in the whole of the furnace quarters, instantly showing what is to be done so that the new conditions are met, without abrupt changes. At present the personnel has become so accustomed to the

would now be welcomed. To sum up, the apparatus gives the chief engineer ractical means for regulating the furnace firing in second with the speed of the engines; easy to the stokers on account cations it gives; the engineer the clock to regulate the fir ing and can give best atten-tion to the other points. The ciable economy in combi and gives greater regularity in the running of the engines. Furnace firing takes place under better conditions of fuel burning and this avoids some of the well known draw-backs of the former method; inst a decidedly longer period of time on account of the sat-infactory absence of sudden

I want to the state of the sail of the



D-The luminous board in first apparatus.



E-Luminous board No. 2. se

## The Continuous Rail in the United States

## A Machine That Crimps a Head Section on a Rail

E Vielt since the fiange was put upon the car wheel instelled of upon the rail, engineers have sought to saudi the useless sorapting of the whole rail, when only 5 per cant to 6 per cent of its upper surface has been were away.

When ratio began to be laid in city streets, about of this small proportion of the rail would necessitate, not only the renewal of the whole rail, but entire recentraction of the track. Investors and engineers devised compound rails with the object of avoiding these costly renewals and hundreds of such rails were patented. The difficulty, which was never until quite recently overcome, was in statching the head or wearing surface of the rail to the base, or supporting members, so that the two members would hold fast together and withstand the vibration caused by the passing wheels.

Progress in rail-making and other atts, has made possible the system recently introduced into this country by a manufacturing company, after it had been tried out in Ragiand and France, where it is known as the "Rompase" rail. During the years 2011 and 1912, four miles of this system of construction were successfully laid in the circ of Chicago.

The rails were made of high carbon open-hearth steel. The head sections were applied to the base sections as to stagger the joints, and after being piaced in position in the street, the flangew of the head section were crimped under the false head of the base section in such a manner as to convert these flanges into springs having a grip of thirty-six tons to the running foot, which grip would easily withstand the streams developed by the heaviest electric locomotive. Only open-hearth steel could be used for the head section, as Hessemer is not sufficiently homogeneous and the larger percentage of theophorous present in high-action Hessemer steel makes it "cold short" and would cause the flanges to fracture doring the crimpina.

The latest development in electric motors had to be utilized to develop the power necessary to perform this

operation with satisfactory speed, and the highest quality of chrome-vanadium steel had to be used in constructing parts of the machinery.

In the process of manufacture the head section of the continuous rail passes through the mill in such a manner that it is more homogeneous, more close-grained, and of greater olectrical conductivity, than rails rolled in the ordinary say. It therefore exactly compiles with the conditions favored by the Committee on Standard Rail Sections, A S. C. E. 1889, who reported that "the grain, or fineness, of hot-rolled steel is governed by the work applied to it as its heat decreases," and "we are convinced that the wearing qualities of rails depend on the closeness of the grain of fine closeness of the grain of the closeness of the grain of the steel in their heads."

Tests made by the railway officials in Chicago show that the fine grained continuous rail head has over 70 per cent greater electrical conductivity than ordinary rail metal.

The staggered Joints and the spring artin of the bead faunces, make it practicable to use the rails as a hegative return, and each Chicago rail was found, after being laid to the track without any weided or other joint, to be equivalent to 2,289,000 C. M. copper. The value of this copper, laid in the street, any be taken at 90 cents per running foot per sulltion C. M., so-that its siddline to september 100 cents.

detailed in

ing the entire expense of bonding, there is a saving in copper cables which might amount in extreme cases to \$16,926 per mile of single track (2 ralls).

16,926 per mile of single track (2 ralls).

The area of electrical contact where the head of the



Mechanism for taking off wern rail faces from a

continuous rail is crimped to the base is (between the joint of the base and the joint of the head), over thirty times the area of the cross section of the whole rail, so that any loss of current at the joints is practically mediatibe. The saving in maintenance due to the elim-

ination of damaged joints would vary with every system, but may be taken roughly as (8) per cent of the total cost of track maintenance

When the continuous rall is worn out and has to be renewed, the saving in reconstruction in paved city streets ranges from \$10,000 to \$15,000 per mile of single track. In Chleago the amount of saving is estimated to be \$11,500 in another western city the saving is estimated at \$15,350, as per details given below

Saving	ln	rulis	<b>\$3,536</b>
14	٠	concrete	2,640
**	••	lubor	4,224
**	**	tles	2,295
	••	tle-rods	270
**	••	tle plates	540
**	••	screw splkes	216
**	**	stone ballust	979
**	**	bonding .	630

\$15,330

The track hild in Engined in 1986 is still in operation and the plants show no legal of emplois, although the three behas been subjected to very heavy traille, so that were and tert on the radius stock from this cause is eliminated. In hying this track, care was taken that no head raths with upward kibss at the plants were placed in the track, and it is essential wherever the grand trac before the care are sum over that track and it is to be altered to the property of the care are sum over the track, and it is to be distributed to the corrustation in adjection of the corrustation in adjection track.

Similar raths were laid on a curve in the Parls under ground railway in a manner to thoroughly test the grip of the head rail flanges, where they stood the test with

Although the success of this system of construction has up to the present time been demonstrated only on street railway, it is advocated for use in main line railway construction as offering a solution to the problems connected with defective rule, which annually consessome two hundred

and forty accidents on steam railways in this country

It is evident that a defect or fracture in either the base or the head section of a continuous rail would simply result in another joint in the broken section, which would remain firm's held together by the sound section to which it is etimped

#### Rolled High-manganese Continuous Rails.

In adapting the continuous rail for underground initivals, it is advantages of staggering the joints of the head relative to the base sections, of the true alignment of meeting rails, of smooth ranalug, and of the absence of hammering joints and fractured rails, are all tended

The table are supplied in the usual bengths and composed of an open-hearth steel lakes rall, on to the top of which is etimped a rolled high-mannanes steel lakes are rolled in the mannanes steel lakes are usually as the result of the top of which is etimped a rolled high-mannanes steel lakes of rolled high-mannanes steel lakes are steel lakes as the steel of the base rall which prejects from these beyond the head roll at the other read, forming when the raths are laid in the truck stage read, or overlapping lobits

The rails are fished together with an improved combined spilee and sole plate placed center with the joint in the rails. Acting in conjunction with the (Continual on page 402)

View of the working end of the electric rall crimping machine.

राम् कार्यक्ष्युक्तमः । १००४ वर्षः १००४



Diver with salvage outfit appearing at the surface.

# Rescue Apparatus for the Crew of a Wrecked Submarine

By Dr. Alfred Gradenwitz



大きなななない いまいしいのないはんだいだいがん

Diving tests performed with the salvage outfit.

HERE are mainly three possibilities fiable to resuit in the wrecking of submarines, viz.: 1. Springa leak as a consequence of collision with another set or with the ground; 2, running aground by fulse maneuvers or fallure of the engine; and 3, fire or ex-

Most-of the fourteen submarine entastroubles on reord, all of which—with the exception of that of the German submarine "13"—have resuited in heavy losses of human lives, are to be ascribed to causes 1 and 2, and only those due to cause 2 in the end may be reduced to a minimum Existing safeguards against the caus coming under 3 are at present so highly developed that catastrophies ascriliable to them will always be of ex-ceptional occurrence. On the other hand, the serious dauger resulting from the first two causes is evident. and it is proposed in the following to disc available for facing it. The salvage aped in the following to discuss the means

paratus at present supplied by the oxygen industry may be divided into two groups, ulz.: 1, apparatus and devices for purify ing the nir (supply of oxygen and absorpthat of carbonic acid and extraled cases) : erging apparatus allowing the crew to leave a wrecked submarine

The apparatus for the parifying of air are mainly characteristic of German submarines. The nit exhaled by the men is regenerated from a store of compressed oxygen kent on board, its curboute acid being absorbed by potast cartridges regeneration continues without interruption until the available store of potash cartridges is exhausted. At moments of extreme distress and in the event of sudden fallure of the lighting plant, the crew will find at certain known places emerg-ency cartridges for immediate oxygen res-

The Installations for use in parifying air on submarines have already proved of inestimable value in an emergency would otherwise inve meant loss of life. The twenty-seven men rescued from the German submarine "13," which on January 10th, 1011, foundered to Kiel burlor. are sudebted for their lives to the regeneration of air with the notash cartridges. Ap-

paratus belonging to group 2 (emerging apparatus) form part of the salvage material of the German and some foreign submarine fleets. England has adopted pot-shaped diving belinets filled with alr which are thrown by the men over their head, shoulders, and breast, thus taking those equipped with the apparatus up The German submarines are equipped with a so-cuiled "diver salvage" outfit, comprising an emerg-ing and a breathing apparatus. Comprehensive tests baving shown its suitability, several foreign navies have adopted the same system

The "diver solvage" outfit has to perform three main tasks It is intended under variable water pressures to warrant a satisfactory respiration. It is to endow the man with sufficient buoyancy for reaching, m were automatically, the surface of the water, while allowing him to control his bnoyancy, so that he may joince even considerable depths (up to 200 feet) with-out any serious trouble. The apparatus is also designed to keep the man for a considerable time floating at the water surface

The whole outfit, when out of use, forms a little par cel cass to stow away. Its weight is about 6 klioames, to which a counterpoise 5.5 kilogrammes in weight is saided. The apparatus is out on like a waistcont and is ready for operation in a few seconds, with-out interfering with the movements of the body and head in the air or water. The ears remain ancovered, and the eyes can be protected by a pair of diver's goggles. The apparatus imports to the man and his outfit sufficient buoyanty even lu the event of its air being inactive. The man employed with the outfit can breathe one hour or breathe and work half an hour in vitiated

air (in the submarine), below and in water, as well as on land if he is again to dive below water or into viti-ated air The buoyancy of the apparatus at the surface lasts many hours without limiting lu any way the sensi

On account of these valuable features, the apparatus would seem to be suitable not only for rescue work in submarines, but at the same time as a useful adjunct for engineers called upon to work under water or in cavities filled with deleterious gases.

The "diver salvage" apparatus is based on the action of potash carridges used so successfully for mining salvage work. The outfit comprises a self-contained oxygen breathing contrivance with automatic air regen-eration and a swimming vest on which the various parts of the apparatus are fixed in such a way as to take up immediately their proper position when the



Salvage outfit for submari from the front.



Diver's salvage outfit

vest has been put on The breathing apparatus comprises the oxygen cylinder, the cartridge for ab sorbing the carbonic acid, the breathing bag carried on the back, the mouthpiece for mouth respiration, the nose clamp and some flexible connection tubes. The mouthpiece comprises two breathing valves insuring a continual circulation of air from the breathing bear through the potash cartridge, so that the air may return into the breathing bag in a purified condition. The exhated carisonic acid is absorbed completely in the potash cartridge. The oxygen required for respiration ls derived from the oxygen cylinder, and a store of compressed air serves to compensate any difference in pressure on emerging from considerable depths, any air submitted to surplus pressure escaping through ingeniously constructed valves.

a account of partial water investon and the impoerge to the surface, is lying at th at a depth of say 100 feet. The transversal bulkheads having allowed the endangered compartment to be left, the crew have gathered in the central compart where the air regenerator of the submarine will for e exclude any danger of suffocation. days to cor Should, however, the periodical air analyses have shown the vivifying effects of the regenerator to be doomed to exhaustion before the rescue work comment the surface may have advanced to the founders the critical moment has come to leave the submarine. It may be said that the crew immediately after the oc-currence of the accident had been ordered to equip themselves with the rescue outfit, with the handling which they are familiar through previous train

After fixing the order in which the men have to to the surface, all preparations are made for leaving to the surrace, an preparations are made for seaving the wreck. Since the latter is submitted to an outside pressure of 8 atmospheres (45 pounds per square inch), escaping is only possible after compensating the pres-sure in the interior of the submarine, which can only be done by allowing it to be flooded with water.

be done by allowing it to be needed with water.

After taking a deep breath, the men put the mouthpiece into their mouths, locking the mouthpiece tap
and putting on the nose clamp. The valve of the oxygen cylinder is kept open until the breathing bag is placed in position on the back. Everything is now ready starting on the last voyage which affords some chi at least of salvage. The moment no doubt is critical.

After loosening the bottom valves of the wreck, the water with a gurgling noise rushes into the compartment, surrounding the feet of those waiting to be

rescued, creeping up along their bodies and closing above their heads. However, in spite of the seriousness of the situation the men are for some time at least pro-tected by life-giving oxygen. The pressure on the cars after some energetic draughts is relieved. While the right hand is ap-plied to the valve of the oxygen cylinder, disengaging at intervals the supply of vital air, the left hand encompasses compressed air cylinder, thus compensating any pressure difference in the apparatus. After some minutes the whole compartment, spart from a layer of compressed gases, is filled with water. All lutches having been opened, a welrd green light penetrates into those depths, if the sun be shining above the waves. One after the other, the men now emerge from the hatches, seize the cable of the emerging buoy and the anchor ropes, and rise swift-ly toward the surface. The sir expanded in the apparatus escapes with a bubbling noise through an extremely sensitive com-pensation valve. The surplus pressure, which otherwise would weigh he the cheeks, throw the monthplece out of the mouth and crush the man, is never feit in a really disturbing manner After reaching a depth of say 50 feet, the man

stops for about 2 minutes and tries to animate his blood circulation by agilating his legs, snimate ms brood circumston by aguating ms legs, while allowing any stagnating nitrogen to escape. After a further pause of 5 minutes at a depth of 20 feet, the finel ascent to the light and to the courades engaged in the salvage work is accomplished. A safely working arrangement enables the man to throw breathing apparatus on reaching the surface; the up-per part of his body, however, is protected by the swimming vest, until he leaves the water.

## How Mold Fungi Live

C ABRYING out his researches on the nutrition of mold fungi, A. Kossowicz showed that certain fungi of lower orders, especially the aspergillus, penicitium, mucor and others, are able to assimilate ures and uri acid and to produce ammonia in consequence. Lately he finds that different species act in the same way in regard to glycocol and hippuric acid, and on the other hand he notes that some of these fungi are also able to utilize the utrites alone as a source of ultrogen. He even finds some specimens which develop very well in a glucose medium containing one per cent nitrite of potannus giving rise to ammonia. Together with Von from the group race to ammonia. Logenser with you Groller, he studies cultures of numerous spores and the-teria in mediums containing sulpho-cranic compounds, and it appears that some of these organisms are able to the such compounds as a source of sulphor and nitro-ges, but do not find in them all the carbon or nitrogen.

It is claimed that some of the escalppius of Australia are tailer than the California redwoods, which are commonly considered the highest trees to the world.

er that Lights the Ho An american mant Ligarat the frome PARTS inventor has combined a A ligarde with a small dynamo and stor-case bettary so that the sowery which the human meter produces when working the careriser, instead of going to warte, is stored up in the accumulator. The idea is a simple one, as will be observed, and in case the premises are not wired up for care the premises are not when the current the device may prove a most useful one for many purposes. In this way it is possible to use one or several small lamps for domestic lighting, so that the work done with the exerciser during the se can be taken advantage of in the evening. One point to be noticed is that the fact of using electric lamps gives a stimulus to the use of the machine for the e of exercise and is apt to prevent the daily exercise from being neglected, now that it becomes necessary. The present machine is designed to work several lamps with an hour's pedaling, and when there are several members of the family to use it, the number of lamps and the amount of light to be had from the device of course increases accordingly. Two sizes or course increases accordingly. Two sizes of machine are used, one to work with a storage battery of 12 volts and 12 amperes, this being intended for the use of not overly strong persons, while the second size is intended for use with a 12-volt and 25-ampere battery and serves for persons

# The Chagres River in Flood

A 8 we have explained from time to time in these columns the Chagres River, which so long proved a menace to the Panama Canal, has been tamed and put to useful work by the building of the Gatun dam and power plant. Some idea of the tremendous power of this stream when in flood may be gained from the companying photograph, which shows the waters pouring over the spillway before it was complet fulshed, the mad capers of this wild tor-fent have been overcome. The river, which was known to rise 25 feet in as many hours, is now checked by the hill of clay that closes the Gatun Valley, forming a te so large that the mighty floods the past now represent a rise measurable in fractions of an inch. The waters may be let off as desired and a large part of them is used to generate electricity for light and power throughout the Canal

# A Motor-driven Road Builder

A SELF-PROPELLED road building machine has been tested in Los Angeles with results that are said to be highly satisfactory from the standpoints of efficiency and economy. The engine which does all the work is a six-cylinder, distillate burning gas engine of 80 horse-power, which operates a series of bucket chains that dig the soil to any depth down to eighteen inches, and the tooth-armed an inches, and buckets are so powerful that they will cut through a finished pavement if it be de-sired to rebuild old streets. The earth is picked up by these buckets, carried to a mixer in the body of the machine and thoroughly combined with any desired binder, hot asphaltum or crude oil, and is then spread evenly and rolled, all in one operation. A trailer containing the binder follows the machine, and it is necessary to have a string of them in readiness as the device operates with great speed. The earth is dug up, mixed, relaid and rolled at the rate of fifty square feet a minute for an eight-inch depth of asphalt pave-ment. A very advantageous feature of this method of mixing is that it is uniform from base to surface, so that th is no danger of the surface's buckling. Of course where the mixture includes crushed rock, it is necessary to spread this material before the machine. The chains of buckets are independent of each other, or occeen are independent or each other and as each has a width of six inches it is possible to form various combinations for roads of different widths. The mani-mum number is aloved. Thus, for a twenty-foot roadway, the proper on





he he the Toursland Insur

Bells give warning in the dark. Storing up energy on the exerciser.



The Chagres in mad flight over the Gatun spillway.



Machine that builds fifty square feet of road per minute.



oline-electric plant for lighting a circus

ould be ten chains of six-inch buckets, so that four operations over the road would combine to make the required twenof width. The muchine was de signed by John Marray, a local luventor and road builder, and cost about \$30,000 It is a huge muchine with a length of enty-five feet, but a smaller and less expensive model is projected.

# Poison Bottle Alarm

W E can give no estimale of the namber of lives that have been lost or endangered by the careless one who picks up a bottle from his medicine chest in the dark. But this thing is being constantly done, and measures should be taken to prevent it. Recently the matter has been given prominence in the deliv papers, ow-ing to the death from this couse of several persons of prominence—It has been suggested that polsonous tablets be given a peculiar shape, different from ordinary tablets. Another suggestion is that the bottle be provided with a stopper from which a number of needle points proje so that the stopper can not be removed in the dark without pricking the fingers Still another suggestion (which is filus trated herewith) is to provide the bottle with bells that will sound a warning when it is picked up. If some or all of these methods were adopted, no doubt they would prevent many deaths and much suf

# Agricultural Progress in Canada

THE Canadian government has uppro-priated a sum of \$10,000,000 to cover a period of 10 years beginning with March 31st, 1913, for instruction and research in agriculture Purt of this will be applied to furthering the work of the Federal Department of Agriculture by assisting and developing the live stock, dairying, fruitgrowing and other industries along lines of investigation, improvements in trans-portation, etc; while agricultural education of all grades will be materially en The agricultural colleges are to be improved, elementary schools and short courses in agriculture, hortleniture and dalrying are to be established, and agriultural teaching is to be introdu the public schools. The sum of \$20,000 a year is allotted to veteriour, colleges.

# Modern Circus Lighting

ASOLINE torchilghts for the chr G have gone To-day we have in their place in the modern circus portuble electric lighting plant. The senson just closed saw two of the largest circuses equipped with the up-to-date lighting systems

The accompanying photograph shows one of the unit outfits of the 25-kilowatt portable gasoline-electric plants that have been manufactured by a well known company of electrical engineers especially for these circuses. The sets are made in units and a complete outfit consists of three trneks-two trneks currying cuch a dupilcute system, while the third truck is the care system, while the third truck is the snipply wagon and has monited upon its roof a powerful searchlight. This sourch-light is used especially for the aid of workmen employed in learning down tents, etc, preparatory to loudlog the circus There are also to the plant two 25-ampere spotlights used upon the stage

The outfits are mounted on one of the ordinary circus trucks whose ends and sides are removable. Each plant consists of a compound would, direct current generntor, built integral with the frame and direct connected to the shaft of a four eylinder, vertical gasoline engine. The set Is installed on the rear of the wagon with the flywheel at the onter end. At the front of the truck is installed the cooling system for the engine. This is a pressed steel radiator cooled by motor-driven fans

A 65-gallon cylindrically shaped water tank is mounted over the radiator. Un-derneath the truck in the center is swing the gasoline tank and engine muffler.

All tents are equipped with protected wiring which can very readily be either down or installed for use when necessary.

# Inventions New and Interesting

Simple Patent Law . Patent Office News . Notes on Trademarks

Recent Improvements in Conveying Devices THE imp riance of the problem of transportation is usef oridout. That the ramarkable development of the past bandred years w and never have been possible had not the railway and the steamship been invented is

a platitude

From the stand; it t of ec nomy money and e From the stated it to ee noney money and security strength in the cramp ring; thing does not change it. It follows that at a step which lessens the cost of transporta tler 13 d a li the art is a clear gain

the n v l st ps in the solution of the problem of trust rtatl ir liems usually bec me a matter of record by being jut nted. It is the jurpose of this article to call atten the briefly to some of the apparently more important h ventl us which have been patented during the pasyear in that branch f the art of transportation com monly known as c nveying devices or conveyers

Conveying devices as distinguished from cranes ele

vators, helsting machinery rallway systems and the like are chiefly of five types namely endless carriers recliptively of the types limited states and conveyers, fluid pressure devices and chites spouts or rollerways down which material is impelled by the in

Ordinarily conveyers move material comparatively short distances seldom more than a few hundred feet They are often found in relation to some machine or structure in which case they may become highly spe claimed in form yet retain and exercise but the one function-the moving of material-as in pneumatic stokers and furnace-charging devices

Endless Carriers Endless carriers are for the most part wheels the

axes of which may be either horizontal vertical or in clined, and helts Phe term belts is here used in a broad sense and includes endless chains of buckets and endless carrying cables as well as the ordinary

The flat belt has many desirable features. It is simple strong and has great carrying capacity. The last may be increased by the use of a series of trough ing rollers that tilt the edges of the belt up thus making its cross section trough shaped

A patent (No 1021846) on an improved form of troughing riller was granted to Mr R T Pearce of Montelair N J April 2nd 1912. To the roller shaft are keyed the usual central pulleys (Fig 1) This shaft is supported by and turns in two end pulleys of bell shape that are mounted in fixed journal boxes the belt passes over the set of pulleys the central pul the central pulleys, being of larger diameter than the central pulleys, being of larger diameter than the central pulleys turn in the journal boxes at a lower speed. The central pulley shaft turns in the bell pul kys at a speed equal to the difference in the angular speeds of the belf and central pulleys. The advantages claimed for this arrangement are that it is simple, and that the friction between the belt and the pulleys and between the pulleys and the journal hoxes is reduced

In case the flat belt is to be used on inclines some means must be employed to prevent the material espe-cially if it be of a granular nature from sliding or rolling back down the belt and accumulating at the bottom Slats hooks buttons and the like have been

Mr E C I Van Wert of Valhalla N Y has obtained a patent—No 909 419 August 1st 1911—on a device for this purpose consisting of a set of three plates that when attached to the belt forms a combined belt and bucket conveyer. The larger of the plates as indicated by Fig. 2 is riveted crosswise of the belt at its center Flanking the large plate at each side is a er plate similarly secured to the belt. of the small plates are connected to each other by a tension spring that causes the edges of the belt to tilt np or trough Thus this construction besides pre venting material from wilding down the belt also diss with the troughing rollers commonly used

In the past few years there has been considerable lemand for a satisfactory device for elevating ashes and other refuse from the basement of city buildings sidewalk Such a device should of course, be It should be collar sible in order that it may be stored underneath the sidewalk. It should be easily fed of large capacity so that it may interfere with sidewalk traffic as little as possible and should deliver material directly to a wagon or other vehicle stand-ing at the curb Reciprocating elevators blocks and tackles awinging cranes, and in a few instances end less carriers have been used for this purpose In a ent No 1025168 issued May 7th 1912 to August adh of Yonkers, N Y there is described a novel device of the last class

In this device as shown in Fig 8 a counter frame normally beneath the sidewalk carries a sidewalk over and als) supports a swinging frame Passing over a pair of sprocket wheels at the head of this swing

ing frame and around a pair of driver spreads located in a pit in the basement floor is an entitle of buckets. In use a wagon is backed, sip to the the counterbalanced frame is raised, the shafes ing frame swung out and an electric motor! lower sprocket wheels are driven is threwit tion. Material shoveled into the pit is deli wagon without further he

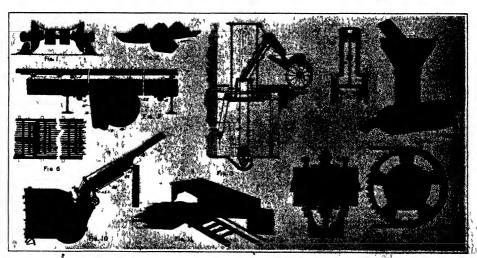
The endless conveyer finds considerable use in action with drying chambers. A form now being ly adopted by laundries is an endless must a sprocket chain, that passes around appr or pulleys whose axes are arranged vertically, ers, constituting means for attacking garanguis chain, are secured along it at intervals.

coam, are secured arong m at marrens.

Patent No. 1,025,938, was stand to William Eastbodomew of Chicago Ill. May 7th, 1912, for a newsl and at the same time simple hanger. In Fig. 4 the chaip 12, supported by carriages 13 that travel on overhead tracks, is shown provided with two oppositely arranged. tracts, is shown provisions that the hanger consists essentially of two jawn, one fixed and the other pivoted thereto, that are non-mally held closed by a spring. A dog pivoted to the fixed jaw is arranged to drop in and engage beliefs the edge of a slot in the pivoted jaw to hold it open when desired. The dog is extended at 85 to form a handle. At the point where the garment is to be discharged an inclined face 16 is arranged in the path of the upper and of the pivoted jaw.

The operation is as follows The attende the garment between the jaws then grasps the handle and lifts the dog As soon as the dog clears the edge of the slot the spring causes the jaw to close upon the garment. The hanger then pass es through the Arriva As it emerges from the chamber the up end of the pivoted jaw comes in contact with the in-clined face which forces the jaw open and allows the garment to drop. At the same time the dog fulls behind garment to drop At the same time the con-the lower part of the pivoted jaw thus automatical holding it in position to receive another garment. Reciprocating conveyers, by which are meant tho

devices that impart a step-by-step movement to the load what may be termed the reciprocating bar The first what may be termed the requiremental part at the area type, as the name suggests consists of a reciprocating trough-shaped frame in which the material rests throughout the whole conveying operation. The speed of the forward stroke is usually greater than that of



Recent advance in the art of improving conveying devices that lessen the cost of trut

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-8 the This invention relates the This invention relates the This invention relates the This invention relates the This invention provide an atomic and reliable trolley in rising parts can be quickly interest the displacement of the trollets.

# Of Enterest to Farm

Of Superway to Parmorra.

Fig. 75. This invention is an improvement upon the one for which the Junke received Laptop, Superative Sup



ton frame which is rectangular and oblong. The object of uning the two heards at the hot tous which are on the north side of the frame to the control of the frame that the plants are not not, no as to prevent the rays writing the plants with full force and the object of the wires is to hold the plants or where and keep them of the ground. The top of the frame may serve for supporting burish or where canner facilities for the control of the frame may serve for supporting burish or where canner facilities for the control of the frame may serve for supporting burish or where canner facilities for the control of the frame may serve for supporting burish or where canner facilities for the control of the frame may serve for supporting the facilities of the facilit

or water course name to plants to proceeding the PEOW — Of 1 Ds Foncis, care of L. E Reacitg, Seth St and Brown Ave Brite, Pa This device assolutely overcoince side direct in easily or ridding plows and is capable of attachment to any kind of whole supported plow in the supple of adjustment in accordance with the character of the soil and door above and is engable of adjustment in accordance with the character of the soil and door leaves the soil without fasteriering with the furning of the farrow gain of the farrow gain

Of Semeral Insterest
VANITY ROX — L. Motess care of Rite Speciaity Co. 36 W 38th St. New York N Y
This invention provides a box of novel and
structure form and construction having special adaptation for being carried in a hand bag



SLEE VARIET BOX.

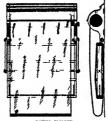
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# Moneshold Utilities,

TOWEL HOLDER.—E A Hoop care of Rense Martons & Goldsmith, Pierre, S D The invention provides a holder having a roller on which the towel is normally rolled and a flat reel pivoted to pivoted arms to which an



TOWEL HOLDER,

end of the towel is secured and on which it actied portion of the towel nay be wound as that the rect carrying it solied portion of the towel may be disposed in a vertical position against the wait out of the way and supported by the arms

by the arms

CURTAIN ROD SUPPORT J Knoem, 107

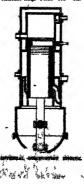
I 17th St. Manhattan N Y N Y The purpose in this case is a provide a support or irack t arranged to permit the manufacturer to conveniently assemble the parts und t allow the user to readily place a curtain rod in post ition on the support of to remove it therefrom whenever desired to place a curtain on the rod or to remove it therefrom

Machines and Hechanical Dovices
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and quality is always visible

ARTIFICIAL LIMB—I B Stags, Wabeno
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usul log MACHINE FOR CLEINING REPARATOR DIRKY—J HANGEN Beadebasen 1 Kolding Ribb Drimark. Cleaning the sit mis agidate of the low lines in a contribugal cream a parators is a very troublesome process, since the dirt in the milt is deposited on the diaks in hard cakes, or creats, which cang he re over dozy by meeas of strong and long continu of brown of the contribution of the contrib

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tion is an improvement in that class of explo-sive segment it which two bollow piscons are segment to be an included by the con-tained by the contained with a triple crush shaft in such manner that they reciprocate stratishneously in opposite directions an act reactions are contained by the contained by citizen the in a preciously as an air pump for special uses. The engraving illustrates wellfool section of the engine angire showing the explosive mixture is ignited by a spark ploy

plug VAPORIZER FOR GASOIINE ENGINES I vow Walef ME 136 E 23rd St. New York N Y The vaporizer is made in a double dome shape of wire gause. In the center he treen the two hurrs of wire gause is located the vaporizer made of a special absorbent mater at that simultaneously vaporizes the gas mix lare to a vapor. The center is any raw game like is prevented from getting latto the cylin like is prevented from getting latto the cylin



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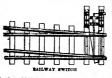
THE VAPORISER AS ATTACHED BETWEEN THE MOTOR AND CARBURETER

VAPORIZER FOR GASOLINE ENGINE

dera and cutting tie oil causing the notor t run with less friction increasing the vapera sion and producing more power at the asse-tions preventing the carbonising of the cylin lers. The device officusing prevents any fanner from at ooting through and igniting any gazoline arest the carbonered use to back thring Tests have shown a swring of 25 per cent to and tract owner this actor device and econ-omisers she used to the contract of the con-omisers she under the con-

# Ballways and Their Ac

RAILWAY NWITH B — C A TOWNER and A IS. MOWARE P O BOX 355 Hamlet N C An object in this I proven out is to provide neans f r positively locking the switch tongu s me as t pr v nt accidents due to the owner of the tours s may from the rails. A



further object is to provide means connected with an ordinary switch stand for operating the songue-locking mecha im No more effort is required to operate this switch and the switch locking mechanism than in the ordinary errich. The lilustration shows a plan view switch The

# Persetnie

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GAME APPARTUS—R. Kancruss 410
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AUTOMOBILE ATTAL HMENT — J W

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AUTOMOBILE AFTA HMENT

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FIRE DEFIATING CAP—Ja on H HARD,

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TIRE DESTATING CAP

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the same to one end of the driving wheels of the velicle the attaching means serving to bold it defram against dist a ut y th toruing movement in ther lir it n ut per mitting the renoval f ti lir 3 a n ve-ment in the direction of the axis f the irun

Norm.—Copies of any of these patents will be furnished by the Sc entry c American for ten cents each. Please state the name of the patentee title of the invention and date of this paper.

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overlapping joints, this holds the rati maintains them against both vertical and maintains them against both vector and transverse stresses, but is sufficiently flex-ible and at the same time has a spring grip contact of such strength as to withtand the vibration and jarring set up by eavy traffic, and so effectually prevents the joint becoming slack or working loose It automatically adjusts itself to the rails and is more quickly assembled than the



Section of continuous rail, showing base rail and crimped-on head.

out in exactly the same manner as when using ordinary rails, except that the joint ing ends of the rails engage one over the other for a length of four inches.

Renewals of the continuous rail can be earried out with less interruption to traffic than on the ordinary system, as the overlapping joints will carry the trains be fore the rails have been fished together and while they are being fished.

# Recent Improvements in Conveying Devices

(Concluded from page 400.)

the return stroke. The material is thus caused to travel in a succession of for ward and backward steps in each of which the forward step is the greater. In the second type the load is moved forward by a bar or similar element upon which it may rest or beneath which it may lie. The feature that distinguishes this type from others, however, is that the load is supothers, however, is that the load is sup-ported, during the return stroke, by some element other than the bar which has moved it forward. Thus, there is applied to the load only a succession of forward

The supporting element may be anoth bar or series of bars, counterparts of those that have given the first forward movement. Each bar may consist of a series of parallel bars, in which case those of one set are arranged alternately or in interfingered relation with those of the other. Heretofore not more than two sets of bars have been used in a single conveyer-unit

Pierre Lorlliard of Tuxedo Park, N. Y., d a patent on August 15th, 1911, No. 1,000,828, on a similar form of conveyer in which three sets of bars are em-ployed. As shown in Figs. 5 and 6 every third bar is a part of the same set. The mechanism by which the bars are move is shown in Fig 5. The bars of each set are connected by crossbeams 5 that are mounted on sills 6. Each sill is supported on rollers carried by two similar rock arms 9 pivoted to rigid supports at 11. The tops of the rock arms are connected by a link 12 This link is pivotally connected to an arm 13 that is mounted to swing on the rod. Near the middle of arm awing on the content of that bears on the outer face of a cam 18 secured to power-shaft 17. Arm 18, mounted to swing on rod 19, is connected to still 6 by a pin-and-slot 20. A roller 21, near the middle of the arm travels in cam slot 22 cut into the face of the cam 16. Each set of bars is oper-

The Continuous Rail in the United which throws the rock arms to a position nearly vertical, thus eleviting the bars, the same time roller 21 evines as 18, causing the routing roll of the routing rolls of there to move longitudinally with set or pers to move longrenamenty went the load. At the end of the stroke the bars sink and deliver the load to the ris-ing bars of another set. The first named at then returns to its initial position. In installations comprising only two sets

motion that is said to be largely overcome by the present device. It is also said that less power is required than was necessary with the older forms.

Screw Conveyers.

The screw conveyer is particularly well
adapted to handle granular material. Its
most desirable features are its simplicity,
there being few parts, all of which may be protected, to a considerable degree, fr wear, and its compact form.

w conveyers are of two types. consisting essentially of a screw or he mounted upon a shaft that is rotatable in a fixed casing, and the other, a rotary cas-ing to which the blade of a helix or screw ternally attached.

The first type is the one usually em ployed. In it the screw has been driven heretofore by means of power applied at the end of the shaft. In installations of the end of the shaft. considerable length difficulty has be considerable length dimently has been ac-perienced because of the twisting of the shaft. The metal in the screw being farther removed from the axis of the shaft than the metal of the shaft itself, to twist. As a result internal stre in some cases have caused the blade to separate from the shaft have been set up. By means of the device patented by fr. W. D. Mount of Saltville, Va., on Mr

July 16th, 1912-No. 1,032,850-it is de signed to overcome this difficulty by drivsigned to overcome this dimenty by driv-ing the conveyer from a plurality of points along its length. As indicated by Figs. 7 and 8 this device consists primarily of a hollow sprocket wheel that is fitted beween the ends of adjacent sections of the conveyer easing. In order to prevent spilling of material, spring-held bearing rings are arranged to fit snugly against the opposite faces of the sprocket wheel. Pairs of rollers, mounted on the sprocket wheel, that travel on the outer surfaces of the bearing rings serve to center it in re-spect to the conveyer shaft. To the conveyer shaft is secured a radial arm that pair of lugs in the bore of the spr theel. Power applied to the teeth of the sprocket wheel acting through the lugs and arm rotates the co veyer shaft. Ther is no interference with the flow of mate rial in the casing.

Fluid Pressure Convey

Fluid pressure conveyers are of two types: In one, fluid under pressure high-er than that of the atmosphere is introduced behind the material: in the other tion. Both types are used to a large ex-tent in handling substances of granular or fibrous nature, particularly ashes, sawdust, cotton, grain and the like.
In patent No. 1,020,962, March 26th.

1912, granted to Cornelius Cable of Elkthe type first referred to above. The novelty is said to reside in a special form of nozzle through which the conveying on nozze through which the conveying fluid, in this case steam, is admitted to the conveyer pipe. As shown in Fig. 9, the nozzle is provided with faring ends. The nozze is province with naring ends. The end opening into the conveyer pipe has a smooth bore; the other is rifled or grooved internally. Upon steam being admitted the material is given a whiring motion

the conveyer tube. Within the past few years fluid presence conveyers, known as "nonumatic stackers," have largely displaced other forms used in carrying ettaw, from a threshing machine to a bars or stack. The puseumatic stacker consists of a fin and its casing, a conveyer tube, and a hood or ared by a similar mechanism, the three distributor that is statehed to the super mechanisms being arranged, however, 120 edgrees spart.

The operation is as follows: The rost-tree the strain, at various distances the strain at the substitution of the sum causes are 12 to swing been made telescopie.

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Kanma City, Mo. July 1, 1918.

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# CRUDE ASBESTOS

R. H. MARTIN



A deridedly novel form of stacker tube to that instented by Mr. F. L. Sattley of Enthumpolis, Ind., No. 907,996, July 11th, generalpoon, inc., No. 201,200. July 121, 1821. 16. comprises a non-telescopic tube-saction having the lower half of its upper end est away as shown in Fig. 10. To the upper edge of the lower half of the tube-section is hinged a filer that consists tube-section is hinged a filer that consure of a number of hingedly-connected semi-cylindrical sections. A guideway 30 is secured to the lower side of the tube. A bar 38 carrying rollers 56 and hood or deflector 52 may be moved in and out along this guide, by means of an endle cable 30 and crank 43. The hood fits closely to and slides along the inner surface of the upper end of the tube. It is probable that the tube is more rigid than those formerly used since it may be made in a single piece.

Operation: Assuming the filler to be in

the position shown in full lines, material passing up the tube strikes the hood and in deflected downward. In case it is desired to discharge the straw farther out, the crank is turned, thus projecting the the uppermost of the filler-sections which the uppermost of the inter-ections when is thereby swung up against the tube. In this manner the cut-away portion of the tube can be filled step-by-step while maintaining a constant relation between the deflective and the end of the filler.

# Gravity Conveyers-Accessories.

It is often necessary to install convey-ers so as to carry material from room to room or from story to story. The passage-ways through walls or ceilings obviously become excellent avenues for the spreading of fire. Although building regulations in many cities require that provision be made for confining the fire to a single room, very few devices for this purpos

Patent No. 1,022,525, issued April 9th, 1912, to B. H. Alvey and M. U. Bernheim of Louisville, Ky., covers a fire-hood designed for co-operation with a rollerway As shown in Fig. 11 it consists of a metal frame, open at one end, that covers the opening in the floor. The opening in the frame may be closed by a door that swings on a horizontal pivot arranged across the upper edge of the opening. The door may normally hang in a vertical plane or may be secured to the roof of the hood by a fusible link. When closed it abuts against a filler that extends from the floor

to the upper edge of the rollerway. The operation of the door is of case the fusible link is not used, packages case the tunion link is not used, packages coming down the rollerway strike the door, awing it up and pass on, after which it immediately swings shut. When the link is employed the door closes only when the temperature in the hood equals or exceeds

# Losses in the Ohio Valley Flood

THE United States Geological Survey has just issued Water Supply Paper 334, dealing with the Ohlo Valley flood of Murch-April, 1918. In view of the widely divergent estimates of losses that were current at the time of the flood, and the fact that these losses were undoubtedly ter than in any previous visitation of the kind in the same region, much inter-est attaches to the figures on this subject collected by the Survey by means of circular letters sent to the officials of two hundred and six cities and towns in the should district. The losses reported by the towns in question, added to the losses reported by railways and traction lines, total \$180,878,097. These figures represent noral \$180,073,097. These figures represent actual damage, and do not include indirect, or "economic," damages. More-over, they apparently take no account of losses sustained by the rural community, suiside of town limits. Certainly \$200,—200,000 to account of the control of 600,000 is a very conservative estimate of the total actual and immediate losses. Considering that this loss was due to a single-dood, in a region in some part of shigh dood, in a region in some part of shigh Books occur from some to five times shigh year, one gathers an idea of the ha-hames wan of meany that the nation is justined in spending on preventive mea-ting. From the same source of informa-tion. From the same source of informa-tion the beares learns than 155 lines were less; in the same source of informa-

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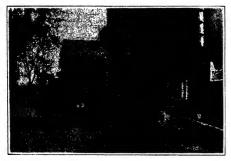
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# THE WEEKLY JOURNAL OF PRACTICAL INFORMATION

VOLUME CIX )

NEW YORK, NOVEMBER 29, 1913

PRICE 10 CENTS



Filling the ailo by electric power.



Electrically operated butter churn and butter worker.

# Central Station Power for Farmers

Relieving the Tedium of Farm Work by the Use of Electricity

By D. R. Palmquist

 ${f R}$  EALIZING that the farm offers a large outlet for electric power, many central stations throughout the country have extended their transmission lines into the From these lines they are supplying the farmers with electricity for light and power particularly true of the States throughout the corn belt. The general farming in vogue there requires a targe amount of mechanical power, for grinding feed,

shredding fodder, cutting ensilage, thresh ing, and pumping water. The farmers throughout this region, the majority of whom are conducting their farms on a scientific basis, take to this new form of power as a duck would to water.

The manufacturers have done a great deal in making it possible to use electric power on farms, as they are now offering all sorts of farm machines readily adapt-able for electric drive. There is scarcely a modern electric device for the farm that is not effecting a large saving in time and is not errecting a large saving in time and a consequent reduction in the smooth of hired help needed, for most of the ordi-nary appliances require but one operator. In order to make this article more pruc-

tical and instructive, I will include some data and information, s cost of using electric power on farms.

Cost of Farm Installations.
At Eureka, Illinois, there are about At Eureka, Illinois, there are assu-twenty miles of transmission lines, tra-

remains a good around unitered. At the present time, there are about sixty farmers on these times. Most of them live near the transmission lines. Some, however, are not so near. This necessitates the building of branch lines, which is done by the company, at the expense of the farmer.

The company's plan is to place transformers in the most convenient place for distribution to three or more most convenient place for distribution to three or more farmers, if possible, and to require them to bear the expense of buildings the secondary lines from the trans-formers to their buildings. The farmer also pays for the wiring of his house and barns.

Motors are used for all purposes, such as pumping water, grinding feed, sawing wood, elevating grain into cribs and grammines, on cream separation, church, wash-oribs and grammines, on cream separation, church, wash-

ing machines, sewing machines, fans, and most of them use electric from.

Many have large tungsten lamps on poles in door, the was lightly to be a factor

barn and feed yards, and without exception they ap-

norn and reed yards, and untout exception trey ap-preciate these lights very highly. The following data show what it is actually costing the average farmer in this community to equip his house and farms for electricity, and also the new he finds for it.

Farm No. 1—Cost of wiring house and barn, \$80; cost of meters, \$51.50; number of lights installed, 30,



Electrically operated fodder cutter.

number of motors justified 2: size of motors 5 horse power and 1/2 horse-power. Farm machines operated by above motors: Feed grinder, grain elevator, cream

Farm No. 2 .- Cost of wiring house and barn, \$112. cost of meters, \$51.80; number of lights lustailed, 40; number of motors justailed, 2; size of motors, 3 horseower and ¼ horse-power. Farm machines operated by notors: Grain elevator, feed grinder, cream separator,

court, pump, wash machine, grind stone.

Form No. 3.—Cost of wiring house and harms, \$86;
cost of meters, \$51.50; number of lights installed, 30,
number of motors installed, 2; size of motors, 3 horsepower and 1/2 horse-power. Machines operated by above motors: Feed grinder, grain elevator, pump, cream sep-arator, wood saw, wash machine.

The above are typical of the average farm installa-

tions at Eureka, Illinois. As these farmers become more accustomed to the uses of electricity and realize its advantage, they will apply the electric drive to their many other farm muchines

Last January fourteen farmers petitioned the power

company at Eureka to extend their lines or limit elec-tricity would be available for their use. At that time the power plant was taxed to the limit, which did not enable them to take on any more custom-

They are now enlarging their plant and intend to take on these farmer

Operating Cost of Farm Machines.

Bearing in what that electricity is available for both light and power, let us see what it is costing these farmers to use electricity. Based on an average of 19 cents per kilowatt hom-equivalent to 71/2 cents per horse power hom - the cost of lighting amounts to a lifth of a cent an hour for a sixteen candle-power tangsten lamp. For power purposes the rate aver-

nges about 5 cents per kliowatt hom They say that when a horse begins to eat Its head off, there are two ways out of the difficulty Either work the beast hard enough to earn its keep or look around for a means of power with a more reas able appetite A one horse power motor costs approximately \$65, with an operat-ting cost sverigling 5 cents an hour. A good horse costs from \$150 to \$250, with an operating cost averaging 8 cents an hour

A one eighth horse-power motor equivalent to one man power costs \$40, with an operating cost of less than one cent an loan. The Department of Agriculture states that the farm horse averages about 3½ hours of work a day the year round, and be eats folder steadily. The electric motor, on the other hand, consumes energy only when it is in operation

Now let us consider some of the farm unrelines to which electric motor drive has been successfully piled and from which the cost of operation has been deduced by authoritative tests. These tests were made under actual working conditions on farms, and though the figures are susceptible of slight variation, due to individual controlling circumstances, they afford a fair standard in considering the advisability of using elec-tric power on the farm. All operating costs are based

(Concluded on page 417.)

# SCIENTIFIC AMERICAN

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The Editor is always glad to receive for examination illustrated articles on subjects of limely interest. If the photographs are shorp, the articles short, and the facts sublicitic, the contributions will receive special attention. Accepted articles will be paid for at

The purpose of this fournal is to record accurately, simply, and interestingly, the world's progress in scientific knowledge and industrial achievement.

# Rest and Railway Safety

EVERAL years ago, when the New York Central Railroad inaugurated the twenty-hour service to Chicago, the Editor of this formal. Chicago, the Editor of this journal was given an opportunity to ride in the cab of the several engines which pulled the train over the various divisions. On the round trip he rode on some eight or nine engines and talked with as many different enginemen. Subsquently, he met by appointment the engineman wi emen Subse covered the run from New York to Albany and back, a veterau in the service. He was tall, well set up, clear eved, of ruddy complexion, and in his off-duty clothes he might readily have been taken for a prosperous, well-preserved business man of sixty years. We mention preserved business man of sixty years. We mention these facts because at the outset of our talk about his experiences, he told us that for thirty years he had been at the throttle of the fastest expresses that were run out of New York city on the New York Central system. There is a popular impression that the man who pulls an express train is subjected to such severe mental strain, that, after a very few years, he has to be transferred to less strenuous work on slower local trains, to give him an opportunity to recuperate; yet here was a man who had been doing this work for the greater part of his working lifetime and had come through it in perfect physical condition

we spoke of this popular belief and asked what was the secret of his successfully carrying such heavy responsibility without any impairment of his physical or mental equipment. "It may be," he said, "that I um temperamentally suited to this work; but my own selled is that my present physical condition is due to the fact that I have taken the very best care of my health by abstaining from stimmiants, keeping regular hours, and above all, being careful to get sufficient sleep

Now this little talk of many years ago is brought forethly to our recollection by a document, sent out by the Pennsylvania Ballroad Company, which states that it is considering the advisability of establishing a rule, that employees must live or take their rest sufficiently near to their work to enable them to report for duty any hour, day or night, with not more than one hour of necessary traveltug between their homes or restlug places and the point where they begin work. The state ment goes on to say that many cases have come to the notice of the management, wherein men are living considerable distances from their place of work, and that though they spend only a reasonable time on duty, so much additional time is required in traveling to and from work that they do not have sufficient rest and recreation. In some instances men live from 50 to 100 miles from the place where they report for daty.

If this company should take well-considered action in the matter, it will establish a precedent which should be followed by every railroad throughout the country and we believe that the present is a very opportune time to set such a movement afoot. The terrible disaster at North Haven on the New Haven Railroad is fresh in the public mind. In their investigation of the accident, the Interstate Commerce Commission found that in each twenty-four hour period, Engineman of the colliding train, mainly because he lived a considerable distance from the point where his run begon, had best than six hours of rest in bed us-his home. The Commission stated in its report that no engineman who took his rest in such a manner as Engineman Miller did while performing double duty, could be in proper physical or mental condition to perform the exacting service required of an engineman on a high-speed passenger tran.

We are in hearty accord with this opinion. It would

we are in nearry accord with this opinion. At would be possible to establish a rule which would equitably cover every interest involved, so that the men may have every reasonable freedom in directing their private lives to suit themselves, but always under the wate nives to suit themserves, but always more the eliphalton that they shall live or take their rest at points which will enable them to report for work with-out undue time being consumed in their doing so. Con-dideration of the interest of the traveling public, the railroad companies, and of the trainmen themselves demands that specific rules should be laid down cover ing this most important question.

# Not Sea Water, but Sewage

MONG the long-neglected municipal problems which will confront the lately elected adminitration of this city is that of sewage disposal than which, surely, no more vital question affecting the physical well-being of the five million inhabitants of

New York can be found to-day.

There is a popular and altogether erroneous belief that because there are tidal movements in New York Harbor, and because there are heavy currents in t North and the East Rivers, the sewage of the city is no sooner disgorged into these waters, than it is swept away, carried out to the Atlantic, and harmlessly dissipated in the sea

As a matter of fact, nothing of the kind hap The huge floods of sewage (they are nothing less) are discharged into the rivers and the bay and there their solid contents are deposited and there they remain twenty-four hours there is poured into the Hartem River ninty-nine million gallons, into the North River one hundred and thirty-two million gallons, and into the East River two hundred and sixty-four million gallons of sewage. And this, be it remembered, has been going on in its relative proportions for centuries. The flithy deposit resulting from this back-yard method of disposal has steadily accumulated, until the waters that surround this, the second greatest city of the world, are underlaid by an unmentionable deposit, the mere thought of which should bring a blush to the check of every citizen in this age of advanced ideas as to cleanliness and decent sanitary habits

That there is movement in the waters of the bay and river is true; but it is a movement merely back and forth. There is no endless sweep of the whole mass of water out to the sea, and the substitution of unpolluted water in its place. The Metropolitan Sew-erage Commission of New York proved this to a demo-stration by placing flouts in various localities and recording their movements. One of these floats put in the East River, traveled in 78½ hours a distance of 107% miles, at the end of which time it was picked up one mile from the starting point. After lear this, need it cause any surprise to learn further, that every year the Department of Docks and Ferries dredges out some 400,000 cubic yards of deposit from the slips and docks of the lower East River, to say nothing of large quantities that are also dredged out by private enterprise?

Now the Sewerage Commission, which is of engineers of international reputation, has drawn up a plan of sewage disposal, which, if followed, will serve to clean up the maritime backyards and alleys of this city, and substitute in New York conditions that are wholesome and decent In this plan the Harlem River is taken cure of by trunk sewers which will lend to a large settling basin at Ward's Island, where the solids will be taken out and either burned or carried to see in barges, and there dumped. The North Shore of Long Island, within the city limits, is to be provided with a similar trunk system, with a settling basin for a like method of treatment at Tallman's Island, on the Sound. The greater part of Manhattan is to be served under the proposed scheme by smaller local set-tling basins, located at the foot of various cross streets, e the solids will be incinerated. are to take care of the sewage of the East River from Newtown Creek to the upper end of Blackwell's Island The worst and most polluted section of the East River from Newtown Creek to the Battery will be relieved by the construction of large, main sewers along the opposite shores, the contents of which will be led in a tunnel reaching below Brooklyn to Coney Island, and thence to a largo settling basin, built three miles out at sea. From this the siudge will be taken in tank steamers and dumped 90 to 100 miles out at sea.

The plan of disposal, as thus worked out, is based upon methods, the efficiency of which has been amply demonstrated in existing plants erecywhere. It pre-sents a ready and not too costly means of escape from the present, intolerable conditions; and it is to be hoped that the incoming administration will make this one of the earliest measures for civic improvement to receive their indorsement

Engineering Competitions in Gar Navy
HE European eraise of certain satisfaction of
Atlantic Flort will furnish an excellent oppotunity for close competition in suginecting service conditions; and the performance of the service conditions; and the performance of the washing orusing the Atlantic together in the vorgage to said from the Mediterranean will be washed with the clea-test attention. In the days of the satisfies also; the amount of freeh water available on board was to the which generally gave the greatest concern; but the cli-limportant factors for the seaman are now the damost of fuel on hand, the amount that must be expected in steaming so many miles per hour, and that ne for the maintenance of the officers and men. of the extent of our coast line, and of the distances which our vessels may be expected to cover in the event of hostilities, mobility for ships of all classes comog our fleets is the first requis Steaming Navy.

In Rio de Janeiro in January, 1908, the commander-in-chief of the United States Atlantic Fleet, which was then on its celebrated cruise around the world, is then on its ceiebrated cruse around the worm, seeing an order insugurating the competition in engineering for the bettleships and destroyers composing the feet at that time making the voyage to the Pacific. The competition included the development of maximum competition incinced the overlopment or maximum speed under forced and natural draft, and economy of coal and oil under these, and under ordinary cruising conditions. Breakdowns were penalized and water, when received from an outside source, was charged against the ship receiving it. This competition ended against the ann receiving it. This competition enter upon the arrival of the fleet at Magdaleua Bay, Lower California. The distance steamed was 8,210.5 knots, and it was estimated that a total not increase in economic to the content of the conten omy of 1,400 tons of coni was realised. directly due to rovements in methods.

Taking the performances on the voyage from Rio to Taking the performances on the voyage roun and to Magdalena Bay as a standard, it was estimated that 2,425 tons of coal was saved on the run from fan Francisco to Manila Bay. On the same basis it was also ascertained that over 8,000 gallons of lubricating oil was saved. Two vessels more than doubled their cruising radius as far as oil was concerned.

Despite the unfavorable weather encountered on the oyage across the Atlantic when homeward bound, and the long time which had elapsed since the last docking the long time which had elsawed since the last docking of ships, the saving it used compared with the trip from Hampton Roads to Rio on the outward voyage amounted to over 5.5 per cent. The results obtained on this cruise sufficiently demonstrated the advantages of competitive methods, and in June, 190.8, general order from the Navy Department established the engineering competitions as a permanent feature in the operation

Winning vessels of the different classes each year are awarded the trophies, consisting of bronse plaques, which are carried by them for the succeeding twelve months as symbols of their efficiency. Each petty and man of the engineering department of a ship win-ning the trophy is allowed to wear a red letter "E" on the sleeve of his uniform, and these emblems are greatly esteemed by the individuals who have striven hard for twelve months in an unremitting effort to produce economy and efficiency in their department. The commanding and certain engineering officers of a winning vessel receive commendatory letters from the Navy Department

But few of the visitors to warships have any idee f the details to be mastered, and the work accomor the details to be mastered, and the work accom-plished in meintaining the power plant intailed on a modern dreadcought. They have no conception of the devotion to duty which is necessary on the part of each individual working in his own, sometimes obscurs, uncomfortable, and frequently dangerous, corner, with the full knowledge that he must do his part to the end, out of the sight of men, and without the recognition which those who work in daylight above him may The toll of death due to casualties in engis and fire rooms far exceeds that in turrets and mage sines; yet there has been no shrinking, and no holding back. There is no class of men on board a ship with a higher sense of duty, better discipline or tradi or who are more apt to acquit themselves with credit in time of stress than the members of the engineer's division. Their duties are of equal, if not greater, inportance than those of their shipmates who fight the guns. It is as necessary for a ship when called upon guns. It is as necessary for a ship when called upon for battle to reach and to maintain a station favorable for the fighting as it is to show accuracy and skill in for the dighting as it is to show accuracy and shill in gumery after this station has been reached. The men-below cannot hope to see, or to know, what is taking place in the outer world in the final and supress test for which a battleship is constructed. Without the worste, and the training which will insure a proper per-formance on the part of what has been called the "binds gang," success on the day of battle will become imple-sible. To assist in this necessary training and indirac-tion the engineering competitions are doing they pre-form the contenting competitions are doing they pre-formation. The collection of yantable, girts they then ser-vice, most satisfactory require him to be the ser-vice, most satisfactory require him to be the service. 

# Electricity

Processing of Chemicals of New Merchiga.—On November 1et, 1913, the vessify under construction for the United States. Mary. 1000, completed to the following exists: "New York" at the Brooklyn Navy Yard, 99 per equi; "New", "96 per ent; "Novada," 40,2 per cent; "the "Olikhorsa," 18.7 per cent; the "Pounsylvania," 11.8 per cent; and No. 20, the sister ship to the "Pounsylvania," 11.8 shout to have he held like the New York Yard, is shout to have he held like.

The state of the s

A 38,000 tilevest Turbine.—The Interborough Rapid Transit Company of New York city has recently placed an order with the Westingbouse Machine Company for a horizontal turbine of 20,000 kilowatte capacity. The minister of this particular unit will be fix division into two furbine elements; the high-pressure element being a single-flow surbine, operating at 1,500 revolutions per minute, and the low-pressure element being a double-dow turbine, operating at 1,500 revolutions per minute. And the low-pressure element being a double-dow turbine, operating at 1,500 revolutions per minuse. The machine is of the reaction type throughout, and comparatively low blade speeds are involved.

Danger Signals at Grade Crossings.—The Lehigh Valley Raliroad is installing at highway grade crossings danger signals which should prove to be very effective. As soon as a train comes within a mile of the crossing, the signal shows a red light and a gong that can be heard five hundred yards away begins to ring. Both warnings continue to set until the train has passed, when the gong ceases and the red light changes to white. Should not wires become deenaged, or should anything happen to the mechanism, the signal on the disk fiashes to danger and remains there until repairs are made. Nothing short of sotual demolition can prevent the signal from working.

Consuracha Silds Is Cut Through.—The great Cucuracha silds on the Fanama Canal (which, it will be remembered, Bilds the Culders out in the interval between the cossation of excavation and the flooding of the out with water) has at least been cut through, the opening having reached, according to the last dispatches, a depth of 40 feet below the present level of water in Gatutt Lakes and in the out. A vessed carry, it certain officials of the read pessed through, and now that the contract of the read pessed through, and now that length of the contract of the length of the contract of the contract

New Steel Regissent for the New Havan—The first of the new steel cars ordered for the New Haven road has been received, and by the end of the year it is estimated that twenty-five of these will be placed in service. The car is 80 forct in length, and has a sesting capacity of 39 persons. The heating system is regulated automatically by pressure. Each car is furnished with its own lighting system, the ourrest being generated by a dynamo which is run by a belt at tached to the car ards. The floor consists of sheet steel with a composition covering that is freprotor, and the cars are also protected from the heat in summer and cold in winter by a heavy insulation of hair felt and asbeston.

A Seet and Dust Gage.—According to the Electrics, an organized attempt to measure, by means of instruments standardised by the Smoke Abatement Committee, the extent of the soot and dust existing in the stanophers of several large towns and oblies in the United Kingdom has been undertaken, commencing from the first of the present month. The instrument to be used follow the principle of the rain gage a given area being exposed to each all solid matter that either fails by gravity or is borne down by rain. This is collected in a giase receiver placed beneath a duct leading from the collecting surface. The receiver till be removed once a month and replaced by a fresh one.

Test of Asbekan Dam Shaft.—With the exception of some finishing work in the Carrison tunnel, the Catakill Aquaduct is now practically completed from High Falls to Hilleville Reservoir, which lies on the outshirst of New York city. On November 11th water from the Ashokan Dam was sent through one of the great shafts of the Aquedict, namely, shaft No. 1, which is situated at Stone Ridge. The water reaches a point seven hundred feet below the surface, at which level it is carried below the Rondout Valley for a distance of about its milles. The test was completely successful. Other shafts will be feeted in the same way, successively, until the whole switch has been tried out.

the whole system has been tried out.

Artasian Wells in Americals—"It is interesting to recollect, says the Engineer, that over a very large man of Australia, and especially where the rainful is light, it is possible to tap an apparently inenthaustille singly of artasian water, by bottog. In this way much has been added to the value of large tracts of country, both for scote carrying and general productive purposes. Lebent developments would seem to indicate the present developments would seem to indicate the present developments would seem to indicate the present of th

the Committee of the Committee of

Electric Wisdow-cleaning Dovice,—According to a press report, Admiral Prince Henry of Prussia, brother of the Kaiser, has invented and patented an electrical dovice for cleaning the windows of automobiles in rany or freety weather. The device is set in operation by the pressing of a button.

of a button.

Electric Bulletin Board.—A large electric news bulletin board has been erected in Dayton, Ohio, with which news is spelled out in luminous letter measuring 28 by 22 miches. The announcements may be read at a distance of four blocks. The board has a capacity of four lines of fitneen letters to the line, and is operated by a keyboard similar to that of the typewriter.

Electric Vehicle Census.—The Electric Vehicle Association of America estimates that there are 37,000 electric vehicles in use in the United States, of which number about 25,000 are pleasure cars and 12,000 commercial evhicles. Chicago holds the record with 2,800 vehicles. New York with 2,000 comes second, and Cleveland with 1,000 comes third. Forty per cent of New York's motor trucks are electrically driven.

Lightning Conductors on St. Paul's.—Now lightning conductors have just been installed on St. Paul's Catheria in London, and in the ocurse of this work the interesting discovery was made of a part of one of the original ron bar conductors erected about 140 years ago under the supervision of Benjamin Franklin. This bar, which was inside one of the towers and so not exposed to the weather, was still in a good state of preservation.

Motor Tracking as Night.—In his presidential address before the Electric Volicile Association of America, Arthur Williams suggested that traffic organization in New York and other bury oftise could be relieved by nihibituding high for day tracking. There is no reason why wholesale trucking could not be done at night. Goods may be moved from the terminant to warehouse and the moving in large quantities of merchandice to the large department score done not have set be done in the day title of the control of the c

1.200-Volt Line in Holland.—A short interurban traction line is now in operation in Holland connecting Leyden with the two towns of Kabwyk and Noorwyk. It runs on the continuous current 1.200-volt system to the standard gaze, using double track for the most part. After leaving the city limits, the road reaches the town of Ryashurg three miles sway and at this point it divides into two branches which run to the two places just anamed, these being sea beaches on the North Soa, lying at 5 and 7 miles respectively from town. Current comes directly from the Layden central status without the use of substations. Trolley wires are held by middle poles between tracks carrying double bracket arms Trains run every half-hour and are made up of a motor car and two traillers. Motor cars have two ond clabins for controllers and carry two 100 horse-power motors which take current at 1,200 volts by pantagraph trolley.

Carbons for Searchighta.—In most reserchlighte the rays come from the positive carbon of minoritant point is to have a stoady are. Thu is about satisfied by the use of a negative carbon of small diameter, but with large apparatus using heavy currents, the anali carbon soon becomes red for quite a length and burns up quicily. Should the small carbon he inclosed in a tube, this will cast an objectionable shadow. Gen man countractors reduce the was of the negative carbon by placing it in gas or vapor contaming no cargent and which takes off the heat. Again, lengthwise or cross grooves in the carbon, in a refractory material, the carbon consumes faster than the core and this produces a fine point. A good method is to use a current of coal gas escaping from a pipe, and this gas can even be lighted without harm. Solids or liquids, such as naphthaline or petroleum, can also be vaporized by the heat of the arc.

but he see to the arc.

A Reading Optophones.—A year ago an instrument was developed which enabled a bilind person to discover the whereabouts of windows, lights and light objects, by sound. This instrument, known as the optophone, made use of the varying resistances of eclenium cells when exposed to light, and made known the presence of light by means of a telephone. The apparatus has since been improved, to the extent that it is now possible for a blind person to read type. So far the smallest type that may be successfully read is an inch high and it must be photographed whife, as a transparency. The letters of the control of

# Science

The Humers of Science.—Among the list of new books published in a resent copy of Nature we find the following: "Ist es wahr data  $2k^2 = 4$  sit" (ist it rue that  $2k^2 = 4$ ) by Fred Bon First volume  $\delta \mathcal{L}S$  pages. Published by E. Renneke We leave it to the reader to make his own observations.

The Return of Peary's Record.—It is reported that the record deposited by Peary in a carra at Navy Cliff on the northeast coast of (treveland in July, 1882, has been returned by Knud Rasmussen, the Danish explorer who found theoreof. The Danish government, to whom the record was sent by Rasmussen, has officially transmitted it to Admiral Peary.

The Results of Anti-typhoid Inoculation among the French troops in Algeria and Morocco during 1912 were reported by Prof. Vincent at the revent International Medical Congress in London. In western Morocco, while about sateen per cent among the non-nouvaleted contracted the disease, only one in 5,000 among the inoculated dist.

Hans in behavior der Meteorologie. There is perhans no branch of serence in which a single text-book holds a more dominant place than does Hami's Lehrbook in meteorology. It is, therefore, interesting to learn from a note in Screece that a revised edition of this work is in an advanced stage of preparation and will shortly begin to appear in parts. The author expects to complete the work in the autumn of 1914.

Rubber From Wild Letture.—A study by C. P. Fox of two "species of wild letture, Letture considerate and L. Scarzida, both common in the northern United States, shows that the former contains 2.19 and the latter 1.58 per cent of a good quality of rubber. As the plants also centuan lacturerum, which is a recognized drug, it is suggrested that they might be profitably exploited for both these products.

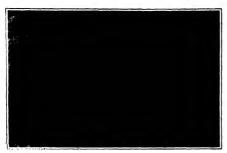
The Purification of Public Water Supplies.—This is the subject of an important momor by George A. Johnson, published as Water-Supply Paper 315 of the U. S. Geological Survey It includes descriptions and illustrations of all the principal filtration plants in the United States, together with a full account of the recently developed methods of water surination with hypochlorites, and the methods of water softening used at a number of municipal plants in the country.

The Chemical Intensity of Sunlight, together with its fluctuations, has been investigated by a great variety of methods, with hardly comparable results. One of of methods, with hardly comparable results. One of the latest undertakings of this kind was earned out at the Hawaiian Agricultural Experiment Station, in co-operation with the Philipane Bureau of Science. Using a solution of exalte acid in the presence of uranium accetact, it was found that the actime effect of the sim was implied at the spring and fall equinoxes, and lowest at the summer and winter solicities.

Aerated Waters in India. A consular report states that the enormous number of Brahmms and Mohammedans in India whose religions strictly prohibit the draiking of alcohole beverages are finding in aerated water a substitute that volaties no religions principle. Among natives of the strictest caste prejudices, who are ordinarily aerated into to our ordinarily shifting that has been prepared by persons of other castes, no objection seems to be raused to aerated waters, which being made by machinery are considered free from con-

An International Institute of Social Statistics.—An international institute is being formed to collect and compile figures on subjects which are barometers of financial, industrial, trade or secuel conditions. It is proposed that monthly figures of the subjects mentioned shall be called by the different nations on a given day sach month to the office of the institute for immediate which is not to be subjects and the subject in the subject in the subject is not only to the subject in the subject in the subject is not only to the subject in the subject in the subject is not only to the subject in the proposed international institute may fulfill successfully this very important function.

Sea Routes to Siberta.—From time to time the GERENTIFIC AMERICA's his recorded the attempts that are being made to establish regular wa routes to the Arcue coast of Siberta from the European solar and also by way of Berning Strait. On August 6th Dr. Nansen left, Varido, Norway, in the steamer "Korreet" for the mouth of the Yunisic River. A Russian government cargo is to be carried to the Yunise and a private necessarile cargo on the return voage. As we have previously reported, the Russian authorities recently established variety estations on the Yugor and Kara Straits to notify vessels whenever these outrances to Kara Soa are free from no. According to the reports thus received, the "Korreet" will pass through one of the straits mentioned, or through Matyushin Strait, or will crummavigate Nova Zemida. It is hoped that Dr. Nansen will obtain some tidings of the missing Brunsloff expedition, which undertook leat year to make the Northeast Passage by way of Parins Refrait.



Zoology Hall arranged for breeding small aquatic animals.

A section of the Vestibule and Zoology Hall.

# A Laboratory for Investigations of Underground Life

A Grotto Utilized for the Study of Subterranean Plants and Animals

By Dr. Alfred Gradenwitz

THE organisms inhabiting the bottom of the sea have, until recent times, been omitted from the have, until recent times, been omitted from the scope of scientific investigation, and the fauna and flora of caverns, so remarkable on account of their peculiar conditions of existence (absence of light, uni-formity of temperature, cto.) have ilkewise been

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sgiected by scientists until quite recently. A French naturalist, M. Henri Gadeau de Kerville, A French naturalist, M. Heuri Gadesau de Kervini in connection with his excessations while searching for remmants of perhistoric man, discovered a large cavern in an abandoned quarry near 8t. Peer. Being greatly interested in spelcology, he decided to prepar-tise cevern at his own expense as a laboratory for investigating underground life. This remarkable in-stitution, on account of its sessentific importance, has

created a great interest among scientists in general.

The laboratory is situated in calcareous rock The laboratory is situated in calcareous rock and comprises a staircase, a corridor, a ventilation chamber, a vestibule and the laboratory rooms proper. The last include a zeological and a botanical hall and a hall and a back room. Apart from the staircase, corridor and ventilation chamber, the whole laboratory covers an area of no less than 671 square meters.

of no less than 971 square meters.

To the left of the entrance there is a concrete water tank of 2,025 liters capacity. From this the water is conveyed through an underground conduit into two steedments tanks in the zoology hall where aquatic animals are kept. From the entrance door there is a concrete starces of forty steps leading down to the corridor mentioned above. On the left is the vertilize chamber which through windows states with two tion chamber which, through windows fitted with iron blinds, communicates with the corridor and vestib The ventilation of the laboratory is excellent. after many hours spent there, one never has the least feeling of being in confined air. Ventilation is effected through the entrance door, the ventilation chamber, a ventilation window in the zoology hall and a large rectangular chamber in the outer wall of the two laborarecongular commonly in the during wall of the wall also re-tory halls. This wall is bined with a thick layor of earth and stone to protect it against atmospheric in-fluences. A sunshade on the western window of the hall protects this against any reflected daylight hable to enter through the ventilation chimpey Since the laboratory lies in the open country the air in its interior is, of course, of the greatest parity, which is most important in connection with any research rk on underground organisms

In the vestibule there is also a tarred linen curtain In the vectionic there is also a tarred men curtain which, in bright daylight and especially in the event of the sun rays striking the entrance door, wards off any reflected light. As there is absolute darknoss in the two laboratory rooms, there is no need for the walls and endings being blackened. In front of the protective curtain is a table for preparing the plants to be used for experimental purposes; belilud this table is an insect car

The zoology hall contains four aquaria, the two sheetmetal water tanks above referred to, sixteen concrete troughs, a sink, a concrete slab, and on two long tables twenty-four wooden boxes. Some of the concrete troughs twenty-tour wooden hoxes. Some of the concrete troughs are fitted with liels, thus preventing the animals kept therein from escaping. The water from the four aquaris is discharged through a tap into buckets; a hand pump or syphon serves to renew the water in the iron concrete troughs. Since the air is saturated with mosture there is practically no vaporization of water, and on account of its low temperature the water decays with extreme slowness, thus necessitating a renewal

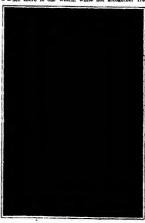
at very rare intervals. On the wall there are several small outlets to the discharge conduit, into which any superfluous water is poured. Candle lanterns with yellow and green glasses are used for lighting. These sufficient light to pass, though arresting practically all chemical rays.

The botany hall contains four border-beds containing The notant hast open and one of the continue o

temperature of the air (generally 5 to 9 deg. Cent) varies only a few degrees in the course of the year, in spite of the excellent ventilation. The water year, in spite of the excellent ventilation. The water temperature throughout the year is 7 to 8.5 deg. Cent. M. de Kerville does nothing to prevent an increase of temperature in his cavern laboratory. However, when the outside temperature is excessively low, as an additional precaution he puts a straw mat on the en-trance door, which, though interfering in no way with ventilation, constitutes an effectual protection against the cold. On account of the uniform temperature, the great moisture of the air and the perfect darkness any plants and animals studied in the laboratory are practically the same conditions as in real grottoes on promises to prove of the greatest utility to scientific investigation

# Animal Training by Magnetism

A MONG the various applications of the electro-mag



Botany Hall, where underground plants are

from the imputation of humbugging the public, has at least the merit of much ingenuity, and may suggether and more creditable services.

Oner and more creatures services.

A genial showman, not so very long ago, happening to see the case with which a powerful lifting magnet was used to handle material, conceived the idea of employing a similar device to assist the performances of a "trained" elephant. The plan was nothing less than the use of what might be called magnetic stencils, to enable the intelligent beast to appear to solve problems in arithmetic and write answers to simple questions
It was found entirely possible to train the elepi

to take up in his trunk an iron holder containing a piece alk, and to move it about over the surf blackboard. The problem lay in the conversion of these nimless scribblings into intelligent and correct rs to questions put, either by the trainer or by the endien

The sight of the lifting magnet gave the showman the ciue to his solution. Before long his exhibition included a wagon with a binckboard side, as thin as might be conveniently made, and containing within it a complete conveniently made, and containing within it a complete equipment of large letters and figures arranged as poles to a powerful magnet, which could be held up, against the inside of the blackboard by an attendant. The attraction of three magnetized symbols was sufficlent to guide the holder in the trunk of the elephant as it was simlessly moved over the surface of the blackboard, and thus the intelligent animal was enabled resa the admiring audience with his ability to write the sums of small numbers and do other things indicative of the possession of human reasoning powers

In view of the interest now expressed in intelligent horses and similar animal marvels, it may be of inte est to examine the extent to which the latest devel ments in applied science are being used in such fields as the entertainment of a circus audience. Possibly the explanations which this line of inquiry may suggest will be as entertaining as the show itself, and very probably further applications will occur both to showman

# Excessive Whaling in the Southern Ocean

Exceesive w maning in the Southern Cream

W 1711 the recent great development of whaling in

W 1711 the recent great development of whaling in

other natitudes has arisen the danger that some

other favorite whaling grounds will soon be worked

out. Thanks to modern methods and apparetus, whal
ing is much more deadly to-day than it was in the

uniny whaling days of the last'century; not only are

more whales of a given species destroyed in proportion

the number deposits of the statement of t to the number encountered by the whalers, but it is ofitable to hunt species that were form ht worth the attention of whalers. During the year 1911 about 17,500 whales were caught in the southern hemisphere, yielding 500,000 barrels of oil, valued at \$8,750,000; and the total catch in 1912 is sup have been 10 to 25 per cent greater than in 1911. South Georgia, where the whaling stations are leased by south recogni, where the whating stations are sensed by the British government to a Norwegian firm, 7,000 whales were captured in 1911, the species hunted in that vicinity being chiefly rorquals, which were once that vicinity being entery requisa, warps were used left in peace by whalese sing account of their relatively small yield of oil and whatebooks. The British Colonial Office has just sent Major Barriet Significing to this whating ground to accertain whether the whales stand in danger of extermination. He is accompanied by a surfamember of the British Managem, who self better rmist of the British Museum, who will bring

Commission C

# What Is Old Age?

# Carrel's Research on the Mechanism of Physical Growth

By Genevieve Grandcourt

(Photographs by courtesy of Journal of Esperim

I N considering the significance of the study of arti-ficiality grown connective tissue as it applies to the problems of development and decay, it is well to keep in mind that this is the supporting tissue of the body; the other fundamental tissues being two in number— the size from which the skin and nerves develop, and the one which makes up the gastro-lightenial tract and the

gastro-intestinal tract and the organs which have to do with supplying food and oxygen to the body.

The function of connective tissue is not uniform. It comprises bone, cartilage, ligaments, etc. From it, also, is grown the network through which the lymph The cells in this network are en dowed with special properties of growth and play a most important rôle in bring-ing about repair when tissue is injured; they, in fact, form the scar in the wound.

texture of connective tissue varies; it may be in whole or in part composed of fibers or elastin, or its structure may be consistently intracellular. Occasionally, the erance of elastin in the fib verts it into true elastic tissue, significant of its mechanical adaptation.

Approximately three quarters of a cen

the origin of tissue was definitely as by Schielden and Swann to be the work done (in proce of division) by the individual cell. Brown had already discovered the cell nucleus, and Wagner had said the

egg was only a cell. Claude Bernard m made known the law that forms starting point of Carrel's investigations, i. e., that the life of an organism is dependent upon the interactions of its cells and of the medium in which they grow, or its cease and or the menum in which they grow.

Thus the problem of understanding the means by which
the body develops, and why it must undergo (at least
in our present state of knowledge) more or less early
deterioration and death, resolved itself into learning the character of these interactions. This was obviously imoutside the body, and so making the process suscentible

Carrel's first efforts after his success in keeping these

Carrie's first efforts after his success in keeping these insense in a state of indefinite multiplication ("permanent life") were directed to studying the manner in which the medium affects the life of the cells. The earliest medium was specially prepared blood (plasma) from full-grown dego or chickens. It was soon apparent that the older the animal from which the blood was taken, the less rapidly and extensively the times grew in it, while in the blood of the relatively defined in the present man are subther the sense of the contraction of the sense of the contraction. old animal, the increase became so slight as to be prac-

Comparative experiments were then made between the effects of the plasma of animals whose ages were respectively five months and five years. The results showed enormously greater activity on the part of the blood of the growing animal, the rate being sometimes haif us much again.

The conclusion reached was that when an animal attains its size (that is, when its tissue stops growing), its blood undergoes progressive changes until it lacks more and more and at last nearly all of the dynamic

Now, the question was whether the old plasms could be given the force of the young, so far as its activity



5. Seventy-two-hour growth (after be 1 168 times through salt solution and was

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on growing cells was concerned. This was accomplished by mixing it with juices extracted from the embryo. When the plasma of young animals was modiembryo fied in the same way, a greater proportional increase in its activating power resulted. In this connection an

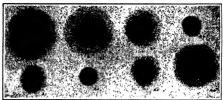


Fig. 1.—Showing comparative rate-growth of tissue respectively in plasma

 $A^1$  and  $A^2$  grown in plasms,  $B^1$  and  $B^2$  in mixed medium. In  $A^2$  and  $A^4$  and  $B^3$  and  $B^4$  the conditions were reversed.

interesting series of experiments was made with a strain of connective-tissue cells which had been kept in artificial life for more than sixteen months

It was divided into two parts, A and B; A being grown in adult plasma, while B was pisced in a medium composed of two parts plasma and one part em-In two days, the ring of new tissue around B was three times greater than that around A.

The cultures were then washed in sail solution (this



Fig. 2.—Seven-day incubator growth.



4.—Showing a forty-eight-hour growth of e (from a test tube cultivation aged four-

particular process being the condition of their "per manent life"), and the experiment was repeated. I grew practically at the previous rate, but A was sta tionary. (See Fig. 1)

Tissue passed through salt solution 130 times doubled

its area in 48 hours. Another growth washed 87 times increused its volume 15 times in 10 days Still another, under special conditions, augmented "more than tifty times in slx days'

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These rapid growths, however, could not be duplicated in normal plasma, the further modifying of which was undertaken In one case it was diluted, in un other substances were added to it, or again its reactive power was changed or its osmotic tension made greater or less By measuring the extent of the new growth accumulated between passages salt solution, it was easy to estimate the varying effects produced by the different media. The relation between the extent of the growth and the particular character of the medium was always the same

Or Carrel says: "As the rapidity of growth of a tissue depends so much on the composition of the medium, it may be come possible to use as a reagent of the dynamic value of the humors of an organism, a strain

of cells adapted to life an vitro.\* If human connective tissue cells could be preserved in a condition of permanent life, as connective tissue cells of the chicken are preserved, the value of the plasma of an individual might be appreciated by the cultivation in it of a group of these cells and by the observation of the rate of their multiplication. These observations would perhaps give some indication of certain values of the blood of an organism and possibly some clew to its age."

it became evident, in the course of experiment, that the activity of tissues was apt to vary, alike in the same lody and in their own parts. Was each particular condition permanent, or did the dynamics of the cells change through the action of the medium upon them?

To determine this point, several pieces of tissue, each having its own peculiar dynamic power, were cultivated in media exactly allke. For a time, differences in the character and extent of the growth were marked. Then the influence of the medium began to tell Measure-ment of changes undergone on the part, in turn of a fast and of a slow growing tissue, showed that the former had lowered its activity one half in forty eight hours, while in the same length of time, the latter had multiplied its activity by six. This process continued until the level of uniformity was reached when the conditions of growth remained equal in all cases

Therefore it was evident that though in the begin-

ning certain substances which the tissue had accumulated had the offect of accelerating or retarding (as the case might be) its activity in the medium, yet in the course of lime, the medium operated to overcome these conditions and bring the growth under the laws of its own special mechanis

Further experiments were tried, some with cells whose growth was stationary Results all pointed to the same

Thus the sum of investigations on the influence of (Concluded on page 420)

\*Journal of Lap Med., vol. xviii. 1913 \*Artificial life - \*Pstlanded (\*)

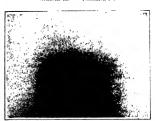


Fig. 5.—Seventy-two-hour growth (after being passed 155 times through salt solution, but not washed in it as in Fig. 3).

# The Mobile Army of the United States

# Its Organization. Equipment and Method of Operations

By a Major of the United States Army

T 1E Regular Army of the United States in time of neace consists of thirty regiment of infautry, fifteen regiments of cavalry, six regiments of field artillery, and the coast artillery, together with the various auxillary troops and shiff departments. The auxiliary troop comprise the engineer, signal and sanitary troops. The staff departments are the General Staff Corps, the Adjutant General's, Inspector General's, Judge Advocate General's, and Ordnance Departments; Quartermaster, Medical, and Signal Corps; the Corps of Englneers; and the Bureau of Insular Affairs. In addition there are the Professors of the Military Academy. The Philippine Scouts and the Porto Rico Regiment of In-

Philippine Scotts and the Fore Rice Regalact of in-fairty are also a part of the Regular Army. The Infairty, cavalry, and field artillory, together with the proper proportions of auxiliary troops and of the stuff departments, compose the Mobile Army which is available at any time for service in the field, that is anywhere it may be desirable to send them. These are the troops which would be organized into armies

to invade a foreign country or to repel invasion.

The Coast Artillery Corps is a technical arm specially trained to handle the large cannon and the submartice mines intended to prevent a hostile navy from entering our harbors and capturing our seaconst cities, naval ing our harbors and capturing our seacostic cities, nawa, stations and depots of suppiles. Those troops are trained to a certain extent as infantry and might be so used in an emergency. As, however, their special work is too technical to perant of their being readily replaced, and as their withdrawal would require that the navy should remain at home to protect our ports rather than to seek the enemy's navy, knowing that it had a secure base behind it, the use of Coast Artillery us part of the Mobile Army cannot be relied upon. The present strength of the Coast Artillery is about 800 officers and 15,000 cubisted men. The men are armed with the infantry rifle, and, as previously explained, are drilled to a certain extent as infaniry

The Philippine Scouts are recruited from the natives of the Philippine Islands. The company officers are mostly Americans, principally ex-non-commissioned officers of the regular army. There are a few mative con pany officers. The senior officers are officers of the regular army, specially detailed for this duty. The present strength is about 5,000 officers and culisted men

The Porto Rico regiment of infantry consists of two attailous of four companies each. The officers are battallons of four companies each. The officers are obtained in the same way as for the Philippine scouts, and the callsted men are all natives of Porto Rico.

The mobile army is organized into four divisions and a cavairy division. Of these troops, three divisions and the cavairy division are within the territorial limits of the United Sintes, except such troops as are in the Hawalian Islands, Alaska, and Panama. The other division is in the Philippine Islands

The company, the troop, or the battery, depending on the branch of the service, is the basis of organization. that is, the samilest tactical and administrative unit The infantry company consists of one captain, one first The intantry company consists or one capcain, one has and one second fluitenant, and seventy-five enlisted men. This is the peace strength. The men are now supplied with the newest prescribed equipment, and are thoroughly ready for effective field service.

The troop, the smallest cavalry unit for administrative purposes, is commanded by a captain, assisted by one first and one second lleutenant, and has an enlisted peace strength of slaty-live men. The men are armed with the rifle, pistol and saler, and are trained to fight elther on foot or mounted

buttery is the smallest administrative and tactical unit of the field artillery. It is commanded by a captain, assisted by two first and two second Beutenants, and on a peace footing has an emisted strength of one hundred and thirty-three men. Each battery is charged with the bondling of four gans, either light (3-luch) or monutain (207-luch). Ammunition for the light batteries is carried in calesons, each drawn by a team of six horses. Amountition for the monolain vell us the gaus themselves, is carried on pack mules. The officers, non-commissioned officers and a few specialists only are mounted, the remainder of the command travels on foot. In the light batteries the entire command rides. Officers, non-commissioned officed drivers and certain specialists are horsed. These noneers all ride on the carriages. The weight behind each team horse amounts to about one thousand pounds. Compared to lands behind draft horses to civil life this does not appear to be much of a load, but it must b remembered that at certain times high speed is required of the artillery animals, not to speak of poor rands, broken country and other difficulties seldom met with

in ordinary commercial traffic.

When taking to the field, each company and each troop is supplied with one escort wagon drawn by four mules. Each battery is furnished with four such vagons, two drawn by horses from the battery and two es. All wagons and all mules are the property of the Ouartermaster Corps of the Army.

We have touched in a general way on the smallest tactical units of the service. There exist in addition the Engineer, Signal and Sanitary troops.

These troops are all organized into companies and battations. The engineer troops are charged with ploneer work, such as road repairing, repair of bridges, clearing away of obstructions in the nature of wire entanglements, blocked roads, etc., as well as the transnds, etc., as well as the tran portation and use of bridge material for the construction of pouloon bridges. The actual construction of trenches and other light field works is the task of the troops that will use them, but in cases of slege or slege erations, the engineer troops aided by civilian lab will have entire control of the execution of the work.

Communication between the larger elements of a

command from Army Headquarters through the divi es is maintained by the Signal Corps troups, by means of wireless telegraph, ordinary telegraph, telephones, hanterns, rockets, etc. This work is technical as well as tactical, and has been brought to a very high state of efficiency. The instruments in common use are excellent in character and of a kind thoroughly suited to field work

The saultary troops are distributed an

ous regiments of infantry, cavalry and field artillery. Their duties pertain to the battle field. Besides those se detailed there are ambulance communies and field inspitals, controlled by the Medical Corps, for the trans-portation and care of the wounded after first aid has n administered at the regimental dressing static

From the companies, troops, and batteries we advance to the buttillon and squadren. The infinitry battallon includes four companies and is the command of a major, assisted by his staff—one adjutant, one quarter muster (both lieutenants). The cavalry troops are or gunized into squadrons of four troops, commanded by a major with the same staff officers as the infantry bat-talion. The artillery buttalion embraces three batteries. The battalion and squadron are merely tactical (fight-

Battalions and squadrons are groused into regiments lu the infantry and cavalry three battalions or three squadrons, while in the field artillery two battalions make a regiment. Regiments have a distinct designa-tion, and are permanent organizations. Each regimen is commanded by a colonel, assisted by the fleutenant-colonel and the regimental staff, consisting of one adjutant and two supply officers. Each regiment of in-fentry and cavalry has its own machine gun company armed with four Colt muchine guns. To each regiment is assigned a chaplain, medical officers and a

The regiments are further grouped into brigades of infantry, cavalry or field artillery for tactical purposes minutry, eavairy or neid artiliery for tactical jumposes, thrigades normally cousids of but one branch of the ser-vice, so that they are spoken of as infantry brigades, cavalry brigades, etc. A brigade is the command of a brigadier general. He is allowed a brigade adjutant with rank of major, and two aids, with the rank of

These brigades are in turn grouped to form the divirives intrances are in turn grouped to form the offi-sion. A division is normally organized as follows: One major general, commanding; his staff, constating of one chief of staff (colonel), one assistant chief of staff (major or captain), one adjutant (major), one impretor (major), one judge advocate (major), one quarter-master (lieutemant-colonel), one division surgeon (lieutenant-colonel), three aids (captains or fleutenants). tenant-cooner), three and conyams or neutranats). Communitors of the engineer and signal troops may required to serve at division headquarters in the capacity of division engineer and division signal officer. The fighting forces and their auxiliaries are as follows: Three brigades (infantry), one regiment of cavery, one brigade of field artillery, one pioneer battalion of englancers, one field battalion of signal troops, four ambulance companies, four field hospitals; also for purposes of supply; one ammunition train, one, supply train

or supply: one stammation train, one, supply train (wagons), one pack train. The organisation of a division is the result of long years of experience, both in this country and abread. It is the one force that might be said to be rounded out. It is the one force that might be said to be countried.

It is featly a small army of about twenty thousand
men, and is self-sustaining. The infantry is the preponderating force, naturally, for infantry bears

brunt of every battle. No enemy can be shet sat of a position. In the final period of an attack that which brings success or failure is the ability of the infants? te gain hand to hand contact with the defenders, size situting fremendous loss of life. This contact may t literally come to pass, but the desire and the willing ness to gain it must exist in such degree that the

ess to gain it muse values with mem will resize it. A command composed of two or more divisions with omplements of heavy and siege artilitery, bridge trains, and the an additional force of infantry and cavalry, a sary supply and ansmunition columns. co a field army and is the appropriate command of a lieu-tenant general. A field army is designated numerically. A command composed of two or more field armies con stitutes an army. It receives a territorial designation and is the appropriate command of a general. Field armies and armies are created only by authority of the

en an army, field army or division moves again a hostile army, or against some other objective, it operates from a base. The line joining the army and this base is called the line of communications. As the ny advances, sufficient force must be left to go

The army is preceded by its cavalry, which keeps a day, or even as much as three days' mare forming a screen for the purpose of warding off efforts of the opposing force to gain information, and at the and gain information. This cavalry acti and gain information. This cavalry acting alone, some-times accompanied by artillery, is called the Independent Cavairy. Behind the Independent Cavairy come the Advance Cavairy. This cavairy operates in group from the size of a patrol of from four to eight troe to a troop itself, and is used for the purpose of stree ening the screen at vital points, and to reconnector dis-tant points that forces of the enemy may have become lodged in, in order by such reconnaissance to prevent urprise of the main body.

At a distance of several miles from this advance

At a distance or several muse from this avvance cavilry marches the Advance Guard composed of infan-try and field artillier, and behind the Advance Guard the Main Body, composed of the great bulk of the troops, followed by the trains and finally the Bear The flanks are protected by Flank Guards or

In a large command the size of an army, one read of course would not accommodate the force and enable it to be placed in action to the front within a reasonable time to be serviceable. Hence, with such a command, several parallel roads would have to be used for the advance, each field army having its own. When an army moves in such formation, the independent cavalry still remains under the direction of the supre mander, but each force on the separate roads would control its own advance cavalry, advance guard, etc.

Communication between columns would be maintained
by contact patrols, bodies of troops detailed for such

Durpose.

The independent cavalry having gained information of a vital nature, the advance is continued for the purpose of gaining contact. The advance cavalry may at this point merge into the independent cavairy. Though not necessarily. Later the advance guard comes into the action with its infantry and field guns, occupies the position seized and held by the advance cavairy, which withdraws, while the action is developed by bringing up reinforcements. Usually when the reserve ce guard goes into action, the artillery is of the advance guart goes no action, the archivery is committed also. It begins its firing at ranges of from two to three thoushed or even four thousand yards. In an advance of this kind, the object is to sentime, and the problem resolves fissif into driving the enemy from his position, either by actual force or strategy. In the former case, it is vital to get as close to the enemy as possible. It has been stated before that an enemy cannot be shot out of a position; he must be driven out at the point of the hayonet, or at teest, the morale of the housile force most he so lowered that when hand to hand fighting becomes framinent at will fall back. To accomplish this the artitlery is breught utrensity into play. Its function is to silectes the hostile artillery. If this cannot be disk, it insue, newertheless neutralise the hostile artillery is by drawing its to itself and away from the shwaring timinger. In addition, as the attacking tributary size efficits the was of affective hostile infantly due, this little is the most of affective hostile infantly due, the little is the standing force may advance. The artitlery has hapeders, a very important past to play, for the satisfer hold in his proportant. ot be shot out of a position; he must be

# discounties consect choice. Influency in these days actually in shall groups, so that with come are moving formed the health greatly, the first come are moving formed the health postline, these constitutes stationary that the section chief to prove chaines that the section chief to greater chaines there is not the section with the ground chaines there is that the section in the greater chaines there is not the section of t rune, ann is eas expressed that troops have arrived at the heafth like enthrily suchanished and opposed by such five action that the sending of reinforcements has been preclicitly impossible. But if the artillery of the at-cellular army has been in sufficient force to allence or respiration bestile artitlery fire, and to sid in keeping the heatile infantry well down behind their trenches, in own infantry should eventually arrive at the enemy's spointfeld well able to drive home the final attack. Before

when the enemy is driven out, the cavalry which at the commencement of the battle is held on the figures for emergencies is rushed in to complete the rout and

sponition well able to drive home the final attack. Before this dual attack, bayonets are fixed and the position is then eareted as in encient days by the personal valor off the individual soldier, using his gun as a spear or

for emergences in reserve in the control of the courty on the pursuit.

The infantry and cavalry are armed with the Spring-eled rife, to which may be attached a bayonst. The bayonst is insued to the infantryman only. The cavalry-

man has instead a revolver and sales.

The Springfield (or United States) rifle is a 0.30 caliber rifle manufactured at the Springfield Agreenal. It has a steel barrel twenty-four inches long, the rifling as none a scene serves twenty-rour means ong, the rining baside consisting of four plain grooves obod of an inch deep, the grooves being somewhat wider than the bands, and having a uniform twist. The barrel is incased in wood and held to the stock by means of steel bands. It contains a magazine bolding five rounds of ammunition. The magazine can be filled and locked and the rife carried in this position in perfect safety. When it is desired to fire, the magazine may readily be unlocked and the rifle by one operation of the breech-bo loaded and cocked. This rifle is capable of being fire 10 to 15 times per minute, depending on the degree of training and experience of the person firing it.

The bayonet is of forged steel, sharpened the entire length of the lower edge and for five luches back from the point on the upper edge. This weapon can be used

or thrusting or cutting.

The 8-inch rifle with which the field artillery is sipped is a built-up gun of nickel steel, of the lo-coll type. It consists of a tube, jacket, locking-he and citip, assembled and mounted on a cradle in which the recoil mechanism is held. This cradle is in turn attached to a rocker which connects the upper parts e carriage. Part of the recoil is taken up by a cylinder filled with oil, part by means of steel springs surrounding the cylinder inside the cradle, and part along the trail which engages in the ground by means of a spade. After the first shot or two the gun car remains practically stationary. The carriage is equ with a panoramic sight and quadrant for firing over a mask such as a hill or other obstruction.

The rate of fire is about ten rounds per minute. The unition is "fixed," that is, the projectile is fitt into a cartridge case of brass containing the powder charge and primer. This gun fires shrapnel and high explosive shell.

The present strength of the mobile army is about sixty-five thousand men. This force would be increased in time of war, first by calling in the regular army reserves—a few thousand men; second, by enlisting the different organisations up to their war strength with en. This would give a regular mob of about eighty-five thousand. A further increase would be made by calling for volunteers, a practice with which the American people are familiar. These would come, the anergan popular terminal. After the control of first, from the organised militia, a body of partially trained isen about one bundred thousand strong; and second, from the mess of the people, totally untrained. If the volunteers did not furnish sufficient seen, resort would be lad, as in the civil war, to consertpiton.

# Mending Celluloid

Mending Collulaid

To Hill immense variety of articles unde of celluloid
for demestic and personal uses gives value to a
simple recipe for mending such articles when broken.
This consists in dissoving fragments of celluloid in
incetons, applying the nesetting solution to the broken
edges like give and then pressing them long-ther. The
solution is made in a few minutes and "dries" or hardease within a quarter of an hour. If pastly done it is
aliant, impossible to detect the location of the break.
The solution of the pression of the continue of the
deligible. This solution may easily be twisted any
desirable finded thes.

# Correspondence

[The editors are not responsible for statements made in the correspondence column. Anonymous com-munications cannot be considered, but the name of governments will be withheld when so desired.]

# Sterilizing Water by Ultra-Violet Rays

To the Editor of the Schriffic American:
We note that you have published on November 1st, page 336, an article on Ultra-violet Rays. In this article regret to have discovered some errors, which we beg you to rectify in your next number.

Your description of the competitive tests in Marsellies, as well as the picture of the apparatus which you give on that same page, leads the reader to believe that the apparatus tested in Marseilles, and shown in the figure, apparatus esteed in survenies, an shown in the latter, was the apparatus of Courmont-Nogier. I refer you to the Comptes Rendus of the French Academy of Science, October 17th, 1910, where this apparatus has been described by Messra, Henry, Helbromers, and Recklinghausen. I also refer you to the official report of the Municipal Water Commission of Marsellies, page 57, where it is said that the apparatus was of the system of Mesers, Henri, Helbronn er, and Recklinghausen

I suppose i need not go into the question of patents which only confirm that the apparatus shown in your publication and put on trial during the famous Mar-seilles test was of the system of which the undersigned MAX VON RECKLINGHAUSEN

New York city.

# Are Men Better Typists than Women?

To the Editor of the SCIENTIFIC AMERICAN The very interesting and timely article in your edition of October 25th, by Jacques Boyer, bearing on scien tific tests to prove whether men or women make the most efficient typists, has won my attention, as the greater part of my life has been devoted to teaching both boys and girls the art of properly manipulating the typewriting machine.

Naturally, from my standpoint, an argument must ome from the practical side of the question, for, prior to the SCIENTIFIC AMERICAN'S publishing that tests have been made by scientists with instruments, the real depth of the question had not been considered. Mr depth of the question had not occur considered. Set Laby, in his article which opens up so interesting a point of view, does not seem to have settled the question of the relative efficiency of the two sexes to his own satisfaction through the agency of selecutife instru-ments, for he says, in his closing paragraph.

e conclusions, however, are based upon to a number of observations to allow them to be affirmed positively and with conviction. The results here given are merely indications which may be confirmed or invalidated by future researches."

invalidated by future researches."
It is not my purpose to endeavor to invalidate the researches written of by M. Boyer, but at the same time I may be able to present a few points on the practicability of typists in general which may be intresting to the SCENTIFIC AMERICAN and help to Himminate e of the dark spots which the scientists have falled

In determining whether men are better typists than on severenming whether men are better typists than women, the history of typisewithing and typewithing contests about be, we think, a paramount consideration Such a history has never been written, but the goment facts have been fairly well recorded in the pages of magazines devoted especially to the interests of typists and typewriters.

When typewriters were first introduced, women found a new vocation The field was at first somewhat evenly divided between the sexes, but of late years women almost wholly displaced the men in this line of Is not this fact in itself an indication of the survival of the fittest?

The size and shape of the hands and fir edly play an important part so far as adaptability to the use of a typewriter is concerned. If mere strength were the only requisite, then the advantage would cerwere the only requisite, tues the autanties would tainly be in favor of the men, whose fingers are generally larger and stronger than those of the women But the man with extremely large and strong fingers. But the man with extremely large and strong ingers is often at a disadvantage when operating a typewriter because the very size of his fingers makes it difficult for him to manipulate the keys. In this respect women have a distinct advantage, as their fingers are more slender and better adapted to the manipulation of the keys. Because a man has large fingers does not, kays. Because a man has large fingers does not, of course, mean that his fingers are not quick in their actions, but that they are not so well adapted to the kayboard. This is supership the cases when all the fingers of the hands are employed in striking the keys, which is the only scientific method of operating a type-writer. Some of the fintegrh shorthand writers in the world have large lands and fingers, but they almost invariably employ a woman typist when making the transcript of their shorthand notes.

As early as 1888 the Canadian Shorthand Society organized a typewriting speed contest to decide who, among the many claimants, should be entitled to the world's champlonship. This contest was held on Angust 13th, and was won by Miss Muc E Orr of New York city. One of the apponents of Miss Orr was the celebrated Frank E Mctimrin. The fact that Miss Orr defeated McGurrin and all the other aspirants for orr detented metalitin and all the other aspiralist for the title settled for many years the question of the world's champlonship and demonstrated the special aptitude of women for this class of work.

Various methods of learning the operation of the typewriter were advocated in the early days, but il was several years after the Toronto coulest before what is now known as the "touch" method became generally recognized as the only scientific way in which the high est degree of efficiency could be altained. Miss Muc Carrington wan the blindfold champleoship but was the Pan-American Exposition at Buffulo and at various conventions throughout the country, became well known as the fastest and most accurate typist in the world re must was conceded to be in the same with Miss Carrington

However, in 1905 a series of speed contests were held at the Business Show at Madison Square Garden Miss Carrington won the blindfold champlonship but was defeated by Mr. Paul Munter and Miss Rose 1, Fritz in the half-hour copying contest. in this contest there were two preliminary trial contests of five and ten minutes each, in both of which Miss Fritz was far ahead of the other contestants. In the final contest Mr Mun ter was just fifteen words uhend of Miss Fritz Had the final results included the five and ten minutes' con-tests, Miss Fritz would have won over Mr. Manter by a good margin

In 1996 Miss Fritz won the world's championship at Chicago, and in the same year successfully defended her title in contests held in Boston and New York. The Eastern Commercial Teachers' Association held a series of contests in 1906, 1907, and 1908. In all, six contests were held, three for the world's championship and three for the world's school champlouship sts were won by the gentler sex

From 1907 to the present year an unumal typewriting outest has been held in connection with the Business Show at New York for a thousand dollar trophy, representing the world's typewriting championship. This trophy was won three times in succession by Miss Rose L. Fritz, then Mr. II. O. Blaisdell won it twice in succession. In 1912 Miss Florence E. Wilson won the trophy, writing at the rate of 117 pet words a minute for one hour. This wonderful record was collesed by Miss Margaret B Owen on the 21st of October last, when she wrote at the rate of 125 net words a minu for one hour, thus whatling the trophy, and the title of world's champion typist

words changion typics. Conclusions to be of any value must be based upon correct promises. That thought came to us when rending M Lahy's article. Were the premises correct? The subjects examined by M Lahy consisted of six women and live men. The women had from two to four years' practice in typewriting, whereas the experience en ranged from two to eight years. Would not the additional years' experience of some of the men add materially to the conclusions in favor of the men? Did the investigator choose the typists because of their experience as all-round expert typics, occulied shorthand writing larve any part in ambing the selections? If a typict is enoughed only in conjung work, should his andi-tory reactions be considered in the results? Another important question which arises relates to the muchine What machine did the various typists whom M. Lahy examined use? Did they all use the same style of ma chine? Was the experience of each of these typists confined entirely to the same machine, or were some common entries to the same machine, were some famillar only with a partleiblar machine, and others famillarly with several styles? Would M. Lahy condider famillarly, with several styles an advantage or dead-vantage in making the experiments? These are only a few of the many questions which readily suggest elves to any one familiar with the work of typist from every point of view

The fact that nearly all of the world's work in this line of endeavor is in the hands of women, and that in open competition for so many years they have carried off the premier honors, seems to us to be worthy of consideration and to entitle women to be considered count. if not superior, to the opposite sex as typists

C E SMITH New York city (Author of Practical Course in Touch Typewriting)

Hudson Bay Fisheries are to be thoroughly investi-gated from a commercial standpoint by the Canadian government, as it is expected that with the opening of the Hudson Bay Railway a large fishing industry will be developed. The number of steamers entering Hudson Bay this year from the Atlantic has been the largest on record, including two which brought cargoes of pitch pine all the way from Mobile, Ala., for use at the railway terminal under construction at Port Nelson



# Automatic tea-measuring machine.

# Labor-saving Appliances of the Modern Great Hotel

Housekeeping on a Manufacturing Scale. Where Mechanical Devices are Used for Everything, from the Boiling of an Egg to the Rolling of a Butter Ball

By Joseph B. Baker



THE running of a modern great hotel is something The running of a nodern great hotel is something more than housekeeping on a gigantic scale: It partakes of the nature of a manufacturing business. The volume of work involved in providing eighteen or twenty hundred guests with food, louding and entertainment makes simplified methods as necessary as systematized management. The operation of a reserved aurant or ordinary large hotel is generally like do housekeeping magnified. The proprietor needs as much room as possible for tables, that pay revenue, and the cramped space allotted to the kitchen is crowded with cooks and dishwashers and hurrying waiters with perhaps here and there a time-saving appliance tucked away in a corner But In the great hotel radically different methods must be employed. The army of hotel servants, the great store of supplies, the intensely active business that goes on in the underworld of the hotel imperatively requires space and therefore allows room also for the installation of mechanical

aids in speeding up the work.

In the conduct of the hotel the ideal is to approximate the service and atmosphere of the well-ordered home—It is to help attain this ideal that special machines or convey a case that the total that special inachines or devices are to be employed. Incidentally such appliances must justify the room they occupy and the capital invested in them by doing the thing, wh tever it may be, with efficiency and economy comparing favorably with the ordinary methods.

The ampliances that are activative and activative and the contractive activative and the contractive activative activati

The appliances that are actually used to meet this need are of three general classes, according as the economy effected is primarily a saving of time, labor seconomy elected is primarily a saving of time, tabor or material Many appliances which save time pri-marily are found in the food-service and housekeeping departments of the hotel. The automatic egg boiler, actuated by clockwork (driven by a lead weight) or a small electric motor, figure largely in the serving of breakfast. This ingenious apphance is one of the few which are found in medium and large-capacity restaurants also; because it saves well-nigh 99 per cent of the time and attention connected with boiling eggs to the patron's order and occuples very little Suppose a waiter has an order for 2-minute eggs. By a single movement the operator of the operator builer places the eggs in a metal basket and lowers them into a tank of boiling water at the bottom of the apphance and sets the index at the 2-minute mark. en he can forget it, for at the expiration of the time set the eggs are lifted automatically clear of the water and a bell may be rung also to call attention. At the busy breakfast hour the gang of egg boilers is in active and their value in time saving is impressively

The slicing of bread is an opportunity for a machine to give satisfaction to guests by a uniform product in addition to saving material. As often happens where mechanical devices are employed to replace hand labor, this machine has its own way of doing the work differing from the primitive hand method, vim, by the motion of a circular knife which divides the lost by a smooth "draw cut," the loaf bong advanced not the thunkness of a slice after each cut. The cold work, differing from the primitive hand method, via. just the thickness of a slice after each cut. The cold meat slicer works on a similar principle, and its work meet sheet works on a similar principle, and its work is far more important to both guest and host, on account of the higher cost of meat. The cold meet to be silend nust be made ready by removing the lone; after that is done an inexperienced by can in a few minuser transform the joint into a pile of silene of slequid tilekness and as attractive to the given as the work of an expert carver. The weightable parer used principally for potatoes and carrots, is a striking instance of a power-driven machine which "peels" by a special method replacing the paring knife of the hand worker.

A sack of potatoes emptied into the hopper of this large machine are scraped by attrition against a revolving abrasive disk instead of by the action of a blade and come out of the machine in their original shape without waste and needing only a few touches with a knife to remove the "eyes." This machine is emmently a time saver on account of the large quantities of pota-present conditions of crowing, as arready indicated. The apple parer and corer, usually hand operated, turns out cooking apples ready for the chef and requir-ing no further attention by hand labor; removing the peel by a blade which is usually adjusted to take a deep enough out to remove surface blemlehes also, the idea being that time saving is more important than the stose boing that time saving is more impos-tion of the exceedingly thin paring obtained by hand work by the careful and thrifty housewives of a former day. Under present conditions the balance between the cost of a barrel of apples and the wages of hand workers makes the employment of a machine of this

workers makes the employment of a macnine or tain type a geniline economy.

Apart from appliances for handling food there serveral instances of time saving in the food serving and housekeeping departments of the great hotel. The telastograph ably supplements the intercom-munication service of the telephone, saving time for messages which do not require direct conversation between sender and receiver. For instance, this instru-ment is annihored to expedite the service of meals ment is employed to expedite the service of meals in the main restaurants of the hotel and also in the private apartments of guests. The written record, private apartments of guests. The written record, a reproduction of the original handwriting inscribed at the transmitting instrument, not only saves time but prevents confusion and errors in the waiters' work. In the main dining-room the waiters may give their but prevents confusion and errors in the waiter's work.
In the main dimig-room the waiters may give their
orders to an "announcer" stationed just beyond the
kitchen door. The announcer, instead of calling out
the order (as is ordinarily done) picks up the pen of
the telautograph and writes it legibly for transmission
to a receiving instrument installed a hundred feet or
more away, under the eye of the kitchen forman.
This man tears off the messages as they come in and
hands them to the cooks and servers; so that by the
time the waiter has arrived in his turn at the service. annus them to the cooks and servers; so that by the time the waiter has arrived in his turn as the serving counter his complete order may be ready on a tray accompanied by a check. The instantaneous trans-mittal of a written record answers equally well in the serving of meals in the rooms of guests. A late riser, mittal of a written record answers equally well in the serving of meals in the rooms of guests. A late riser, for example, has only to step to his telephone and tell the branch exchange operator what he wants for breakfast—making his selection from the daily menu eard. The operator writes the order on her telautograph, and it is reproduced on one of a gang of receiving telautographs in the kitchion. The message is simultaneously reproduced on two other receiving instruments, viz., for the floor clerk for his supervision of the order, and for the floor waiter for him to get his table service ready. The time gained onables the guest a breakfast to be delivered to him in a few muntate via electric dumb—waiter. The telautograph transmits notice of a guest's departure simultaneously to several different departments of the hotel, viz., to the room clerk to inform hum that the room will shortly be available for snother guest, to the floor operate output the room may be put in order, and to the brusekeeper's office for general supervision of the makid's work. Ricetricity has an interesting application in the maked service to rooms. Every maid on coming on duty is given a numbered electric plug. On entering a guest's room to put it in order the inserts this plug

in a springjack at the door causing a little incandessent lamp to light up in the plug as a signal that a maid is at work within. The jack contact also causes a lamp to light up on the telephone operator's switchboard, informing the operator at all times as to the location of the maid; so that in case a guest calls for location of the maid; so that in case a guest calls for a maid for any special purpose the operator can send the nearest available one to her room immediately. Another circuit from the room jack causes a same to glow on a panel board in the housekeeper's office so that the housekeeper knows at all times just where and when the different maids are working just as well as though she personally visited every corridor of the

hotel. The dictograph plays an important part in saving time in the management of the hotel by enabling im-promptu conferences to be held between executive officials at any moment without calling them from their omoises at any moment without caming them from the posts. The entertainment of an army of guests requires good tactics on the part of the army of the hotel staff, and the maneuvering is greatly facilitated by the instantaneous and direct intercommunication afforded

instantaneous and direct intercommunication afforded by the distorpraph.

The telephone installation is of course the major means of communication; if may easily equal that of a good-sized central office. The largest private branch exchange in the world is now in use in a great meterophitan hotel; 16 operators' positions, each equipped with elastograph, 2000 lines and 75 central office trunks, 600,000 local messages per year in addition to many long distance calls and innumerable baside communications.

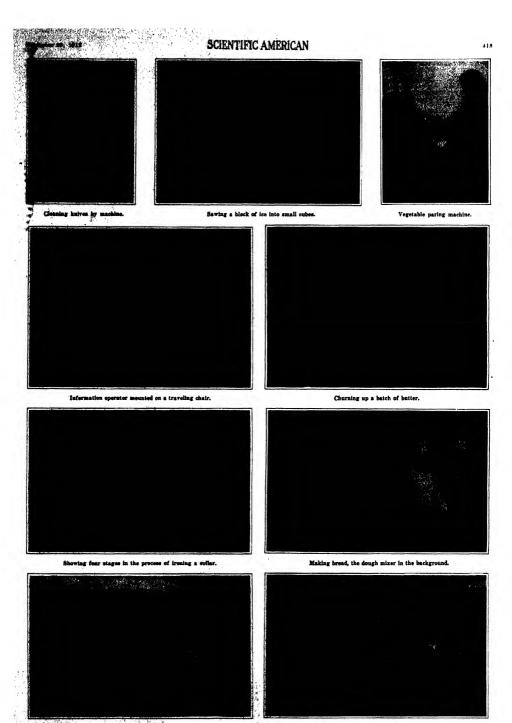
One of the most modern devices affecting the b of the "front office" of hotels is an index rack which renders possible the rapid and accurate handling of renders possible the rapid and accurate manning or information relating to gueste. The ordinary cumber-some index book, which it is absolutely impracticable to use for a very large number of arrivals and depar-tures, is dispeased with and replaced by a rack which exposes to full view at all times, and at a single glance the names and worm numbers of all the guests. By exposes to tuil view at ait times, and at a single glance the names and room numbers of all the guests. By the use of manifolded typewritten allps, made out from the loose-leaf register, this information rack is duplicated in several places so that each department, the telephone switchboard, the mail elerks, etc., have at all times a full current record of the movement of guests. An essential feature of this "unit index rack" system is that the names always appear in their correct alphabetical order, without blank spaces. It is a "live" system, the development of which has been found absolutely indispensable to the operation of the great

modern notes. The information desk, aft essential part of the man-agement of the great hotel, is the nerve center of the guest's activities, just as the manager's office is the nerve center of the hotel organization itself. The nerve center of the hotel organization itself. The information operator, rested on a traveling chaft in front of her constantly corrected index rack and equipped with telephone and telestrogenh instruments, is in position to answer any inquiry that may come in, premptly and accurately.

A very large aggregate of labor—chose missestler offort—in playing in the birthous general telephone constant.

promptly and securately.

A very large aggregate of labor—sheer missesials offert—is played in the littohen, general housekoeping and laundry department by certain mechanical devices. Large electric motor-driven "noup passers" and mayonasise dressing mixer release the labor of several abbedded men for other duties and make for obsenues and uniformity of product as well. This scop passer for making pures for many handred givest consistent of a large sleve full of soft-bodied weng change dressing mixer of slarge sleve full of soft-bodied wegetables, confinantly stirred by a pesile; and the mayonasise dressing mixer (Oneoleeds on page 180).



A gang of automatically thesis egg beliers.

Machine for ironing the bosom, neck-band, cuffs, etc., of a shirt.

LABOR SAVING MACRINERY OF THE MODERN, GREAT HOTEL

# The Heavens in December

# Return of the Third Comet of 1900

By Henry Norris Russell, Ph.D.

S TILL another comet, and again a periodic one, has to be reported this month. It was first seen by Zhuner at Bamberg, Germany, on October 23rd, and wins visible in a small telescope. At that date it was in the constellation Serpens, a little south of the equator, and set atout four hours later than the Sun. As soon as its orbit was calculated it was recognized as a return of the third comet of 1900—the second return since the original discovery, but the first one obed, since in 1907 the comet and the Earth were far

The unnexed diagram of the comet's orbit will make this very clear. As usual, the part of the comer's orbit which lies above the plane of the paper, in which the planetary orbits are supposed to lie is drawn with a full line, and the part which lies below with a dotted

The inclination of the orbit is 31 degrees, and the comet's period is 6.46 years. When the comet was in perihelion at C in 1900 the Earth was at E, about eighty million miles away; and as the comet and Earth were moving around the Sun in the same direction (the comet a little the faster), the distance between the two never decreased far below this amount. In 1907, when the comet returned to C, the Earth was at E, than 160 million miles away, and on the other side of the Sun, so it is no wonder that this return was not observed. This year, when the comet came once more to C (on November 2nd) the Earth was at  $B_n$  only fifty million miles away, and the conditions for observation were very favorable. In 1920 they will obviously again be very bad, but in 1926, unless the comet's period is changed by the attraction of Jupiter,

it should come very near the Earth.

As is the case with all short-period comets, the orbit of this one passes quite near to that of Jupiter. Indeed, at the last aphelion passage of the comet, in 1910, it was pretty near Jupiter for some months, and its orbit may have been a good deal changed.

The comet's apparent motion in the skies took it

rapidly southward, so that on November 19th it was already in 30 degrees south declination, and lost to northern observers.

Of the three comets previously under observation, Metcalf's is in Capricorous in 20 hours 53 minutes right ascension and —14 degrees 20 minutes declination on November 30th, and moving 30 seconds west and 18 minutes south per day. It is then only one third as bright as at discovery, and rapidly decreasing in bright-

Neujmin's comet is now fainter than the fourteenth magnitude, and can be seen only with the large struments. Elements of its orbit, calculated at the University of California on the basis of observations envering an interval of six weeks indicate

a period of 1783 years for this remarka object, but a longer series of observations will be needed to determine the period with

Westphul's comet, on the other hand, is well placed for observation in t It is slowly receding from the Earth and Sun, but should be still a con spicuous telescopic object. The published epitemerides of its motion have already run out at the moment of writing, and no later ones have been received; but a direct calculation shows that during December the position should be as follows:

Nov 20, R A, 20° 35" Declination + 40°

Dec. 15... 20° 51" " + 48°

Dec. 31 " 21° 18" " + 56°

It moves northward and a little westward from Cygnus into Cepheus, passing about 2 degrees west of a Cygni on De-cember 9th. Ity the end of the month it is a circumpolar object visible all night long, but best in the evening

Almost nothing has yet been published concerning its uppearance or physical characteristics, but it seems to be condi-erativ minter than in 1852. In that year it reached the magnitude 4.5, and thought is a little further from the Eurth th time it ought, unless it has really faded. to be of the 5th unguitude on Decemb 1st, and easily vistble to the naked eye; white last mouth, when it should theoretic-ally have been as bright as this, it was actually far fainter and not conspicuous in a small telescope. But the brightness

of a comet is an unpredictable affair, depending larg upon its own internal activity, and usually increase at and after its perihelion passage; and this comet may therefore become visible to the naked eye after

Our map shows how the splendid group of winter constellations which centers in Orion has come fully into sight once more.

The whole southeastern quarter of the beavens is full of bright stars. Perseus and Aurisa are right overhead, and Taurus is just south of the senith. Orion and



Orbit of Zinner's comet.

Canis Major are respiendent in the southeast, and Gemini and Canis Minor in the east. Below the latter rises the head of Hydra, and the "sickle" of Leo is in sight farther north.

sight farther north.

Between these and Gemini is the inconspicuous group of Cancer, remarkable only for the star-cluster ceiled of Cancer, remarkable only for the star-cluster ceiled of Cancer, remarkable only for the star-cluster ceiled only for the star of the cluster are moving together in the star of the cluster are moving together in the heavens, very slowly; and recent measures by Schwarzschild at Potedium show that they are receding from the Earth at the relatively rapid rate of 36 kilometers per second. It seems likely, though not certain, that this second, it is easier likely, though not certain, that this and at the same direction and at the same rate as the Haydes group in Tharms, in which case its distance must be a little over 500 light varies, and the star of the star of the same direction of the same form of the same direction of the same direction of the same direction. years, and the brighter stars in it must be about equal to Sirius in real luminosity.

In the circumpolar sky we find Ussa Major coming up in the northeast, Draco and Ursa Minor below the Pole, and Cepheus and Cassiopsia on the left. The great square of Pegasus stands on one corner in the

western say, with andreaseds apove it, to the left of her. The vast dull est Cates, and Bridanus file the whole so ter of the say.

While the great public of Andrease

visible in the western sky, we may well refer to a recent and very remarkable observation by Dr. Migher recent and very remarkable observation by (2s.) States of the Lowell Observatory. It is well known that the spectrum of this webula closely remainless that of the spectrum of this webula closely remainless that of the spectrum of the solar type. Slipher, by long exiling mathly of the solar type. Slipher, by long exiling with a situation property of the spectrum, with "comparison lime" serving-set at season of the spectrum, with "comparison lime" serving-set at standards of enforces, without a ser of serving-serving to permit a determination of the displacement of lime in the schools' spectrum arising from its isottes in the line of sight. Four plates give accordent; we stalk, and show that the setup is a papirolating is at the enermous rate of 800 kilomaters per second-sche highest very set sets with in such work!

suits, and snow that the secural is appreciating as at the centrous rate of 300 kilematers per seconds—the highest velocity yet uset with in such work. The nucleus of the soluta, which is fairly will defined, shows no sensible proper motion, said unless the needs is ruthing directly toward our system, it distance must be exceedingly great. If such studies can be extended to a few more of the spiral section we may be able to form a much better idea of the dissipation. The Flancia.

Mercury is a moraling star all through December, and is best visible about the time of his greatest delaysition on the 10th, when he rises about 5:10 A. 2A. and is well clear of the horizon before dawn.

Venus too is a morning star and is in conjunction with Mercury on the 2nd, being 1½ degrees south of him. The two planets will make a pretty pleture in the morning sky.

Mars is in the southern part of Gemini, moring slowly

Mars is in the southern part of Gemini, moving slowly Mars is in the southern part of teamin, moving slowiny westward among the stars, and growing brighter until his opposition on January 5th. He rises at 7:30 P. M. at the beginning of the month, and 5 P. M. at its close, and is the most conspicuous object in the eastern sky,

being almost as bright as Sirius.

Jupiter is evening star in Sagittarius, and is rapidly disappearing into the twilight. He sets about 7:30 P. M. on the 1st, and 5:40 on the 31st, by which time he is practically unobservable.

Saturn is in opposition on the 7th, and is visit night long. He is admirably placed for observation in our latitude, being in Taurus, more than 20 degrees north of the celestial equator. His rings are new opened out almost to the full extent to which we ever our amount to the run extent to which we ever see them, and contribute largely to his great apparent brightness (which exceeds that of Capella, and is sur-passed only by Sixius and Canepus among the fixed stars). His brightnest satellite, Letan,

which is easily visible with a three-i telescope, is west of the pianet on De-cember 7th, south of it on the 11th, east on the 15th, north on the 19th, east again on the 23rd, etc.—its period being 16 days. The fainter satellites may be identified by the aid of the diagrams given in the Nau

Uranus is evening star in Capri g about three h ours after the Sun. and hardly observable. Neptune is in Gemini and comes to the meridian about

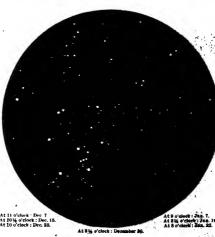
The Moon is in her first quarter at 10 A. M. on the 5th, full at 10 A. M. on the 5th, Neptune on the 15th, Mars-on the 15th, Neptune on the 15th, Mars-on the 3th, Neptune on the 15th, Mars-on the 3th, Neptune on the 15th, Mars-on and Venue on the 25th, Jupiter on the 35th, and Uranus again on the 25th.

At 5 A. M. on the 5thd, the 5th resches his greates, southern destination, and eighter "days" of Chipricioru, and, in the almanach jimass, "Whitele commencione."

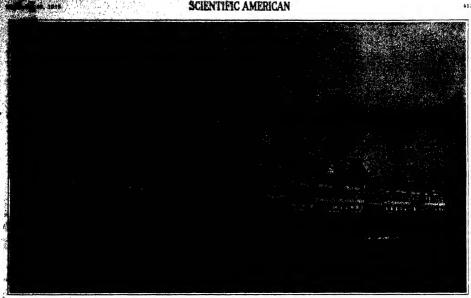
Princeton University Observatory.

Salt of the State of the State

New Plants in the Rational Presenta-in the course of an elaborite stuff by the Forest Service of the graning resources of the national forcess shows in 100 paintifiact-ment have been collected, an examination



NIGHT SKY: DECEMBER AND JANUARY



Length over all, 560 feet, Beam; Of hull, 56 feet; over guards, 97.5 feet. Horse-power, 12,000. Speed, 22 miles Sleeping accommodations, 1,500. Carrying capacity, 3,000.

The Lake steamer "Secandbee," largest side-wheel steamer affont.

# The Greatest Side-wheel Steamer Afloat

The "Seeandbee," Latest of the Large Lake Passenger Steamers

So great is the interest aroused by the remarkably rapid increase in dimensions of the ocean liners. that the public is apt to overlook the fact that a pro that the public is apt to overlook the fact that a pro-portionate growth has been taking place in the size, speed, and inxurious accommodations of those fine ves-sule which ply upon the initiand waters of the United States. It is a fact, however, that the largest steam-ers of that excellent fieer of ships which serves the various ports on the shores of the Great Lakes, have reached a size which twenty-fire years ago was the limit for occar-going steamers, and beyond which in those days it was considered to be unlikely that the ship overse and able builder would care to go. ship owner and ship builder would care to go.

Although the "Secaudbee," which was built for the Buffalo and Cleveland Transit Company of Cleveland, is destined only for lake service, it must be admitted that, with her high freeboard, great length and imthat, with her high freehoard, great length and impeding array of four annotestach, she has very much of an ocean-going look about her. As a matter of fact, he would be inerfectly well able to take her piace, so far as see worthy qualities are concerned, in the fransitation service. This fine vessel, which was built on the lates by the Derroit Shipbentiding Company, to SOO feet in length over all, SO feet beaut, 1974 inches 500 feet in length over all, 58 feet beam, 67.5 inches wide over the guards, and her engines of 12000 horse-power are capable of driving the ship at a speed of 22 miles per hour. The hall is built entirely of steel, with a double bottom thang feet in depth extending for 85 feet of her length. The hall above the double bottom is divided by eleven attractable where the steel of the same deet, With the exception of the collision buthheads and other built-heads with trace 'sentited by the year to the head to the same feet, with heads that are required by law to be without openings, all these bulkheads are fitted with water-tight doors, sperated hydraulically from the engine room. Including

perated hydraulically from the engine room. Incinding its tank tope there are seven decks in all. An expellent flature of the vissel is the fact that the deed construction of the whip is carried up to the community deck, and the housings on the orton and sain decks and the top sides or the promence decks again decks and the top sides or the promence decks again decks and output and output sides of the proment. does. The beams and under side of the promi-deck are shewthen with garbanised iron, lined sever absences paper between the iron and the Preprior while extend from the main deck to make the thing of the same of the same of the paper of the same of the preprint of the same of the sa

NAME OF THE OWNER O



One of the low-pressure cylinders-eter. Weight, 38 tens



The how radder, to assist in savigating tortuou thankale.

engine room and captain's cabin, where aumunciators give instant notice of an outbreak of fire

In a recent editorial on the fire on the "Voiturno." we drew attention to life value of the automatic sprink ier as a preventive of serious fire abourd ships; and we d to note that in this vessel a complete auto matic surinkler system is fitted throughout the interior of the ship, covering all engo holds, crew's spaces, hallways, caidus, smoking rooms and other service rooms of the ship. Moreover when the vessel is docked, con-nections are al once made whereby city protection for

fire purposes can be utilized.

To facilitate quick handling of this large ves the rivers and harbors, she is furnished with a bow rud shown in one of our illustrations. This is controlled by a sleam steering engine located on the main deck forward and the after steering radder is also controlled by a steam steering engine connected to the quadrant by a chalu

The two puddie wheels are each 32 feet 0 Inches in diameter. They are driven by a three-cylinder com-pseud incitical engine with one high pressure cylinder 66 inches in diameter and two low-pressure each 96 in dlameler, the common stroke being 108 inches The high-pressure cylinder is located in the center with a low-pressure on either side. The low pressure evilu-ders are massive, but very perfect castings, each about 13 feet in length and 13 feet high over the steam chests

The main shaft is of open hearth hollow forged steel, 26% inches in the main bearings, 29% inches in the outboard hearings, and 78 feet 6 inches long, with an 11% inch hole throughout line entire length. The shaft weighs 120 tons

Steam is supplied by nine Scotch bollers, with a total grate surface of 500 square feet and a tolai healing surface of about 27,000 square feet

Sound and lake steamers have always been remark able for the extent of their passenger accommodations. The "Secambee" has altogether 510 staterooms, includ-The "Secandbee" has altogether our successions 24 pariors on saids, with private both and tollet, and south private tollet accommodations. The total steeping capacity is 1,500 passengers, which is comparable with that of the largest modern hotels

Aviation in Peru.—An aviation school has been established at Lima, Peru, under the auspices of the National Aero League, and with a subsidy of \$27,000 from the Peruvian government for purchasing aeroplanes and equipment

Periatising to Apparel.

GRHENNY.—Mi savosas, case of M. Lowcanten, 401 liroadway, New York, N y. This
garment is designed for use by women as a
lathing suit, symmaslum suit and the like,
and arranged be suity fit women of different
waist measure, to provide the dealerd confort,
to allow of conveniently donning or removaling
the suit, and to permit of sanitary use without its removal.

PETAINING IO AVARITOM.

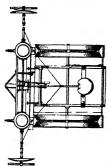
PLYING MACHINE: "U. Quice, care of Mason Furniture to, lunnwille, Aia 10 this machine great strength and lightness are combined with perfect classifity, and the constituent parts are so arranged as to give automatic stability to the entire apparatus, while at the same time permitting my manual adjustment which may be required.

# Of Interest to Parmers.

Of Interest to Farmora.

PRUIT GRADING AIPAIATTIS.—R. II PRACOK. Berlin. N. 3 In the present pattent the invention has reference to apparatus for grading fruit, and particularly fruits of a certain class, such as oranges, the quality of which is determined by the amount of juice which the fruit contains

CHECK ROW PLANTER.—It 1 FOREMAN, care of Fox River Academy, Rheridan, III. Mr Foreman's invention is an improvement in check row planters, and has for its object the



CHECK BOW PLANTER

provision of simple, easily operated means for iripping the seed valves to cause the plants to drop a charge of seed at regular predection mind intervals without the use of knotte-wirs, the said means being operated by the unventent of to usefulne through the field

# Of General Enterest.

REVOLVING VENTILATOR —O W. SRARCY, orre of Chan S Bauks, Sox 774, Manila, P. I. This ventilator is adapted to be employed allowed ships, or in connection with residences



RECENTLY PATENTED INVENTIONS

These rolumns are user to all patentees. The continues are inserted by special arrangement unless are inserted by special arrangement with the inventors. Terms on application to the Advertising Department of the Senzerors Awardon.

Awar

be easily applied and removed, while presenting all of the advantages of a perfectly solid
REINFORCED CONCERTE POLE—H &
ROW. Humistageo. W Vs. This investion
refers to reinforced concrete poles, and more
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METHOD OF MAKING SIGNS.—M. A.

RACHLIAR, CARP OF Mr. Lake, Side Kirby Rt., Detroit, Mich. The object here is to produce agine
letters and the like on significant, from pias
tic material, such as pisater of Paris, motions
of used metals, alloys, amalgama, Scille or
other materials, that become hard and set
from a condition of pisaticity or finishing.

From a condition of plasticity or fluidity.

RTIFFING DOX AND RARING POR

SHIAFTS OF MARINE PROPEDIARIES II. D.

BIACO, care of Bith Marfac Construction Co.

Bath. Maline. The chief object here is to pro
offers influinum friction to the water as the

boat or other craft is propelled through it,

and will reddly adapt little for any anguist

shifting or displacement of the shall relative

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VENTILATOR—J K Rominons, 606 Loudiana Rt. Little Rock. Ark in this case the in
tention comprehends a voidilator provided

with a sationary deaft member such as a pipe,

for the control of the control of the wind

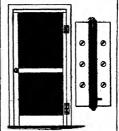
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shifting the cowl under control of the wind



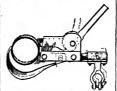
Into different angular positions, the covid being provided with seam for facilitating the travel of all through the dark member, thus forcing a draft within the latter. It is for me in a strice, norms, helis and other parts of an efficiency of the covid parts of the covid parts; crude lineared of the covid parts of the proportion to effect sixing and covid parts; crude lineared of the covid parts of the covid parts; crude lineared of the covid parts; cr

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SPRING HINGE.

tain position, the blues and apring having as sociated therewith a lock for locking the spring against operating io one direction when the leaves have been upsend to a certain cutent lie order to allow the leaves to more lack and for the control of the control



adapted for various vertical and horisontal ad-justments, which facilitate its attachment to a screw pipe coupling so as to econocise time and labor. It is adapted for, convenient detach-neat of its tooth and slidable lug or jaw when worn and the substitution of a new one

Heating and Lighting.

LAMP BURNRE—LEWS P. Moons, Weldon, Ill. The purpose bere is to provide a horser with Morisontic tubes for collecting air from between the crown member of the horser and the chinner, and directing the air to within the said crown member, wings exceeding below and above the bordsontic tubes at each side of the wist tube, for directing the sid from the horisontal tubes to the wist.

VALVE FLOAT FOR CLOSET TANKS....C.
M BRERNER, 210 Trake St., Spreveport, i.e.
This inventor provides a float which will have
not only the permanent air chamber common
to devices of this character, but in addition

Machines and Me

Enablines and Mechanishel Wa CONVENTS TOR MOTELLE SIGHS —B. R. Basen, 16th Arbity St., Val II to the design of this faryunda to mean for conveying side, water in bottling works, from the different. From automatic bottling machines, to in the plant where the goods are to look, alreided and packed, yaelty for

or for sale.

BREING HAMMER.—B. B. Shires

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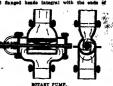
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on the said spring.

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CREMENT THE MARKING MACHINES—— MYDIAMS. HE CITY, KERN. An object here is to provide a device by means of which subject is to previde a device of making the whole the title in which it is to be laid. Another object is to provide a device for making title which bearess the production of a outform grade of well-packed on-cream city. The CHAPT. The provides of the control of the contro



the bladrs, and an opening in the heeds establishing communication between the links and the outlet of the rotor. An object of the invention is to provide an inexpeosite, simple and efficient rotary pump in which the presure necessary for raising the water is obtained by providing inlets in the rotor of a reduced diameter, lying between the inlet and the outlet of the stator

the outlet of the stator PUNP.—H MAIN care of H. P. Jayre, care of Conlings. Thanber of Commerce, Coalings and the state of Louisians, Cal. This improvement refers to oil pumps, and it has for its object to provide one which will hold in suspension uniformly, from the bottom to the top of the well, the sand which is before mainted with the oil or substance which is before pamped

Railways and Their Accessories.
RAILWAY RPICER—O M. MILISA. Tyros.
Ps. This investor devises a neans for spiteing railway rails of a simple and reliable charseier. the same providing for the strend simplicity and facility in unking the application
of the track and also providing for easy remeans or registerated of one rail without disturbing the other.

turbing the other.

RAIL TIE AND ANCHOR.—P. H. Brainrom. care of Stanford Metal R. R. The Ca.,
1105 E. Breed St. Risabeth N. J. The isvanion devises a metalite cross-tie adapted for
the apport of a novel form of rail securing
devices. It produces a combined rail brace
and anchor whereby the rail will be supported
so as to resist all siding and titting movements
by aimpis and visible construction.

Nors.—Copies of any of these patents will be furnished by the Scientific American for ten cents each. Please state the name of the patentse, title of the invention, and date of this paper.

We wish to call attention to the fact that we are in a position to ennote compressit marvices in every branch of petant or rands—mark work. Our stall is composed of mechanical, electrical and chemical superis, thoroughly trained to prepare and presents all pasted applications, reversective of the empirications, prespective of the empirications projection. Our stall pasted applications, reversely the experiment of the entire that the experiment of the experim

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nicetions are extended confidential, netties, extending over a period of only years, enables as in many cases regard to petentability without any is aliant. Our Hand Book on Petente i on request. This explains our flag, the in confidential our on request. This explains our country of the countr secured through us are described to the patentee in the SCIENTIFIC

# NN & COMPANY BROADWAY, NEW YORK igh Office, 625 F Street, Washington, D. C

at Bureau for New Inventions

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# Do You Want to Sell Your Invention?

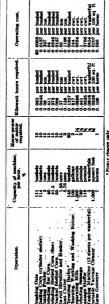
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philos which will become he validity and that infringements. We furnish exper-

# Central Station Power for Farmers (Concluded from page 406.)

on the average power rate of five cents a kilowatt hour and include interest on the investment charged at 6 per cent, deprecia-tion of the machinery at 10 per cent, and



We must remember that these co er both the price of the hired man and his keep. Though it will be discovered that some of the machines in the tests are of large capacity, it was discovered in check-ing by tests of smaller machines of the same kind that the variation in unit cost that is per bushel or ton-was very slight.

It is needless for me to enumerate the many advantages accrued by using elec-tric power, as they are well known to most of us. However, there is one advantage However, there is one advantage of us. However, there is one advantage which the farmer appreciates more than any one cise, and that is the saving in time and lahor. The labor problem on the farm to-day is almost as vital us the maintenance of the fertility of the soil, and every labor-saving device is greeted

with open arms by the farmer.

Although this new field for electricity is yet in its infancy, the time is not far dis-tant when every well-populated farming district will have its transmission lines, for the distribution of electricity for light and power.

# Meteorological Stations in Venezuela

THE Venezuelan government has de-THE Venezueian government nas ca-creed the establishment of meteorologi-cal stations at Merida, Cludad Bolivar, Maracaibo, and Calaboso. This is note-worthy for the reason that aside from the Observatorio Caggal at Caracas there are, at present, no regular meteorologica stations in Venezuela, which is, climato logically, one of the least known countries in the world.

Patents fer Carcal Coffee or Coffee Substitutes.—John H. Kellogg of Battle Creek, Mich., has secured four patents, Nos. 1,099,205 to 1,099,205, inclearle, for carcal coffee or coffee substitute, some of which develop the idea of extracting the liquor from bolied escent coffee and mixing



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General Office and Factory Long Island City, N. Y.

# The Motor-driven Commercial Ve

This department is dec sted to the interests of in ers of motor trucks and deliver any questions relating to mot commercial motor vehicles. ry soupour. The B

# Mechanical Loaders for Motor Trucks

Editor of Motor Truck Department:

In view of the tremendous interest in and-and-clay roads now in North Carolina and doubtless throughout the South Atlan-tic States, I write to ask if there is any effectual sand dumping truck-motor truck-which is also supplied with an applience to load it with something like the same facility with which it may be unloaded. I have been in correspond tion of a dumping motor truck, but, so far as I am advised, there is no machine which can load itself with the same power that runs it nor is there any separate companion machine to do this work. On the contrary, even the send dumping mechine that is described to me, which gets clear of its load so easily, must be loaded by the clumsy and expensive method of she ing it in by hand of day laborers.

In the construction of railroads now and digging of canals they have machines which load flat cars with dirt and debris almost as quickly as they are unloaded It seems to me that a machine may be de vised on the same principle, but of some-what different construction, which would scoop up the sand with such facility as to make the loading of the truck a matter of all expense and time.

If such a machine is put on the market and properly demonstrated in the places where it is needed, as for example in forty counties in North Carolina, there is prac-tically no end to the amount of business that might be done by the enterprising company which put them on the market. There is now an unexampled wave of interest in road building, and this interest is centered in the sand-and-clay road of eastern and central North Carolina, and on the South Atlantic and Guif. Experi ments are being conducted in almost every county and sand-and-clay roads are ed by many experts to be the best il purposes. W. J. PERLE. for all purposes.

[A machine such as this was de in the SCIENTIFIC AMERICAN of July 28th,

# Determining Coasting Ability of Electric Commercial Vehicles

I is a fairly well established fact that the operators of electric commercial ve-hicles are prone to run with the power on a good part of the time when the momen-tum of the vehicle would carry it a consid-erable distance without power, thus effect-That this fact is recognised in rail rond work is emphasized by the action of the engineers of the Hudson tubes between New York city and New Jersey, where meters have been fitted to the cars to ascertain exactly the ratio between the time run under power and the time run without nower. Motormen are encouraged to coast as much as possible without upsetting their running schedules by the offer of ionuses for records of coasting in excess of a standard set by the engineer, and it is understood that the method has resulted in a material saving in operating expense. By way of applying the same principle of economy to electric commercial vehicles a prominent New York firm recently has placed upon the matries a device design of the proposed of t es for records of coasting in exc expense. By way of applying the same principle of economy to electric counterparts of the principle of the number of railes with the power or and conditions are associately favorable. The derive itself is extremely simple; it underly facilities for associately favorable or consists of nothing more completed than an ordinary electric granter operator operated in the unual manner from one of the frict wheels a conclusion is of encodinged in the predicting facilities for associated of the validic. Instead of a study over of The lines, builties the master has been experiented for the principle of the principl

ber of miles covered by the vel-other row registers only the miles covered with the current the number of miles coaste words. As a concrete example of ation of the device, it is polithe makers that a 34-ton el York city without aerious attempt part of the driver to coast showed ing percentage of 20. When the s hicle was driven over the same ro the advantage of every opports coast was taken, it was fo coasting percentage had be an integrating wattmeter discient the saving in consumption of the run over the first run was exactly 11.1 pe cent despite the fact that the exverse speed of the two runs was approximat

# Vaporizing Kerosene by Partial Combustion

THE use of kerosene as fuel in and ternal combustion motor of the mes vehicle type presents difficulties so mi and so serious that though for ye erable efforts have been made to o ome them, very little of real practical value was accomplished until the neo-sary stimulus was furnished by the abnmal increase in the price of gasoline, may be remarked that carbursters feeding kerosene to motors running at practically constant speed are compara-tively easy to produce, and there are not a few that are capable of giving satisfac-tory results; but it is a much more difficult problem to supply a proper mixture at all times to a motor that jumps in a few seconds from minimum to maximum speed and power, and as quickly jumps back, and must run smoothly and sweeth

The majority of those who have attacked The majority of those who havestracked the kerosene carbureter problem have belonged to two broad classes. One has worked along the general lines already well established for the construction of gasoline carbureters, though varying the details somewhat and—what is the chiefconsideration-adding considerable heat from the exhaust gases to further vapori-sation. The other class has worked to sation. The other case has worked to some extent along gas-producer lines, subjecting ferosease, after vaportisation in a carbureter skin to a gasoline carbureter, to a high temperature and so producing aga differing very considerably from the vapor formed in a carbureter of the conventional ferois. ventional type.

Both these forms of apparatus are open to the objection that they depend upon external heat for their operation; there-fore the motor must be started first on gasoline and run on gasoline until sufficiently heated to permit the turning on of the heavier fuel. This entails a com-plete gasoline outlit in addition to the kerosene apparatus. In the carburetes type the vapor produced is easily con-densed by contact with cold surfaces, and it is not always an easy matter to avoid smoke, smell and sooty deposit in the cyl-inders. In the producer type the regulation of heat presents a rather nice pr lem, for while too low a temperature will produce a raw mixture that will not burn

which projects a spark ping in we cantiling a wire genus screen, or significated; proteons the only outlet the chamber, which is piped to the sign of the motor. Part of the kerosene sign by the spark ping and a constant the maintaining in the stream of vapor operation; a re through the chamber by the sucof the engine. The acreen prevents passage of the finne from the vicinity me ping. Approximately one per cent is known to consumed in ministrati-tion finms; the oil is not actually gastthe and is not at all hot when mixed with proper volume of air for complete com-

The varor emerging from the outlet (air Seminare is employed in place of suction to seminare in employed in place of suction purposes) is white and . like thick spoke or steam; it is Mintly warm and will not condense on magasty warm and will not consense on 886 hand. It floats about in the air with persistence. Finely stomized oil con-denses instantly on the hand and does not remain in the air for any appreciable time. Ignited with a match at a little distance from the pipe, the vapor burns with a suick puff and leaves no smoke or smell Atomised kerosene unde r the same conditions makes a dense smoke and leaves black particles floating in the air.

A wide-mouthed quart bottle filled with waper stood open for fifteen minutes, actual time, before the vapor became difficult to see; the bottle was cold when filled. The bottle was filled with vapor, the mouth partly closed, a small amount of air admitted and a match applied, when the mixture burned with a slight puff, leaving the bottle perfectly clean and making no smoke or smell. Repeating this experiment about ten times failed to canno any deposit in the bottle, though obviously the mixture was far from correct for com plete combustion.

As it is difficult to condense the vapor. even on cold surfaces, and as it seems to burn clean when even gasoline vapor would amoke, it would appear well suited to burning in a motor, and experiments with a number of motors in automobiles of different types and sises have been made with parallel results. A gasoline motor with a carbureter of this type will start, when perfectly cold, at least as easily as on gasoline. The only way in which it is possible to cause smoke or smell from the fuel is to temporarily extinguish the curbureter flame and permit raw atomized kerosene to pass to the en-gine, when the familiar black smoke will be emitted. With the carburater function ing normally the exhaust is sufficiently clean so that a handkerchief held close to the exhaust pipe will not be marked, unless by lubricating oil. Misfiring will cause the unburned charge to be passed out through the exhaust, whence it will emerge as a clean white vapor which floats in the air for a time before becoming dissipated. Combustion in the motor apper-ently is slightly less rapid than that of line: the motor runs more smoothly and can be throttled to a slower speed and holds its power better when throttled. In the tests so far made the average power has been above that of gaseline in the same motors. Carburation is not affected by sudden changes of speed. The mileage per gallon has been much higher than with machine to cases more than doub

# or Truck Queries and Answers

Mother Truck Queetes and American values of the control of the con

heavy. The idea who to A. We have had occasion to answer
increases with a sunth religion of
the nature several times, and
these the statistics a space, but sends in several attention has led us to the
spitials that every motor truch installamatters is whon groups series, or
to of the size of the one that you conmatter than the several to be services of a priremains warrants the services or a private staff of repair men and the erection of a private garage. It is probable that several of your trucks—if not all—will be several of your trucks—if not all—will be of the same make, and it would therefore or the same make, and it would therefore be well for you to engage the services of an expert from that factory as inspector or chief repair man. If you employ men as drivers who are intelligent and careful, it is possible that this one factor; expert and an assistant can attend to all of the necessary repairs, replacements and inspections, leaving the washing and cleaning to the services of a man who would not naturally receive as his tions with which are included fuel, and water replenishments—you should arrange to have each vehicle overhauled thoroughly at the end of every six or eight thousand miles. This will keep your fleet in perfect condition, and yet is work that can be accomplished without overtaxing the facilities of your repair organisation. The work will be better done than would be the case were the cars left to the tender mercies of the public garage. for your men will learn the puole garage, for your men will learn the peculiar re-quirements and adjustments of each truck, and the saving in expense will be consid-erable. If you go about the installation of your motor service in the manner that you indicate, we feel certain that it wil prove to be an unqualified success. The erection of a private garage has been found to be economical whenever more than three trucks are to be used same concern. We would urge this one point, however: When building your gar-age, plan for the accommodation of double your intended purchase of trucks, for you will find your installation so efficient and profitable that your business will increase to the point where the extra fleet will soon be required.

> P. L. M. writes: "I have a dairy busi ness in which I now use six horses and wagons for the retail deliveries. In or der to improve the service in one of the districts covered by three of these wagons, I want to put on a truck. I expect to drive this myself, and would like to know if you think a gasoline truck would prove economical. I drive in seven miles before economical. I drive in seven miles before I make my first deliveries, and the stops average about ten to a block."

> A. The retail milk business is one of the very few fields in which the gasoline truck does not always prove an unqualified success. The frequency of the stops permits only a short distance to be covered by each vehicle, and the truck is not therefore given an opportunity to be oper-ated to its full ability. Furthermore, the average driver will leave the motor run-ning during the minute or so required for and during the minute or so required for each delivery, and this may total more than the time during which the car is in operation. This will naturally result in a waste of fuel and oil and will seriously interfere with the maximum efficiency that can be obtained from the truck. Your case is somewhat different, however, you will run seven miles before you will have occasion to stop for a delivery, and the fact that you are to drive the truck your-self and will therefore be careful to avoid the unaccessary use of gasoline and oil may render the purchase of a gasoline truck a most profitable investment. We would suggest one of the thousand pound would suggest one or the thousand pound vehicles with a covered body. With such a truck, you could easily cover the dis-tance from your dairy to your nearest cus-tomer in less than half an hour, and the simmler of deliveries made in a viven time.



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# What Is Old Age?

(Concluded from page 409.) the medium on the cells, was that the um may not only change the dynami possibilities of tissue, but that the char acter of the change may be regulated by a carefully considered modification of the

The question of the influence of the cells on the medium was taken up in turn although it has not, as yet, been studied

This involves the theory that the cells, in the course of their activity, make such demands upon the nutrition supplied by the medium as to deplete it; and that they e the indirect means of introducing into the life process, a chemically destructive agent (catabolism). The result is a gradual slowing down of cellth; in other words, progressive ageing of the tissues and death!

An analogous course was followed in early artificial cultivation. The tissues lived their normal span of life—i. e., a few days—and then died. But it was found that the process of degeneration could be obviated by the processor ageneration has been already spoken of as insuring "permanent life." In other words, death permanent me. In other words, death -for experimental purposes along these lines—has been overcome. These grow-ing in vitro for nearly a year and a half. now continue to multiply faster than those of the embryo. Time, for tissues under these circumstances, simply does not exist.

The burning question is; can this or anything approaching it, be done—ultimately-to solve the same question in the

# Labor-saving Appliances in Hotels (Concluded from page \$12.)

is a first cousin to same, without the bottom, of course. Knife-cleaning and allver-polishing machines, dough mixing and cutting machines, power-driven, are famil-iar. The dishwashing machine is perhaps the most extensively used power equip-ment on account of the large volume of the serving work which it handles; since of every order of food means dirty dishes. The dishwashing machine of whatever type operates by bringing the dishes into type operates by oringing the disnes into contact with a mass of hot water contain-ing a strong cleansing compound and after-wards rinsing them in clear hot water, and some machines add a finishing touch by sterilizing the dishes in live steam. A ical machine handles the dishes in baskets, swirling the hot cleansing water around and among them, the rinsing leav-ing them so clean and hot that they are dy for service without drying with a loth. The best results with any of the machines are obtained by team work, the helpers giving special attention to greasy and "eggy" dishes as they fill the baskets Although the work of machines compares favorably with that of ignorant and uncleanly hand workers, a deplorable short coming in the use of these machines is man; places is that the washing and rins ng waters are not changed often er A law has just been passed by the New York State Legislature and signed by Governor Sulzer prohibiting under penalty as a misdemeanor the use of dishe save not been previously cleansed in a sanitary manner, and prohibiting the n in such cleansing of water which has b come unsanitary by previous use.

Floor scrubbers and polishers, motor driven, are coming into use to replace the drudgery of human labor on cement and marble or mossate floors and on hardwood floors respectively. Vacuum cleaning is usually done two or three times a week. Laundry machinery includes large man-gles for "flat work," manned by a crew of six or eight men, a number of special de-vices for nursing collars, shirts and cuffs into shape in imitation of the best hand work, but with a far larger output than would be possible without a prohibitively large force of workers In one great New York hotel employing about 125 person in the laundry department, from 61,000 to 63,000 pieces of laundry are handled every

th, value of \$100 to \$300 a: day. By means of the ciaborate equipment of spe-cial devices employed—an expensive plant, warranted by the conditions obtaining in a hotel of enormous size—a guest can have his laundry done up and delivered within three hou

within three hours.

The saving of materials by mechanical devices is closely interlocked with the cleanilness and uniform good service also attained by their use. The handling of ice manufactured in the hotel's own refrige ating plant, is an example. The cold brin from the refrigerating machine serve rectly to "keep" the large tubs of ice cream, thus saving the crushing and hand-ling of ice for this purpose. The product of cake ice is cut into cubes by a ga machine and shaved by another machine respectively for serving iced water and chilled fruits, etc., at the tables. Drinking water for guests' rooms is howeve erved in vacuum bottles filled with the cooled drinking water from piping through out the hotel. This dispenses very satisfactorily with the formerly inevitable "ice water pitcher," with its clinking contents of dubious ice. A number of food dispensing appliances, primarily designed to give satisfaction to guests by serving a uniform quantity and quality, also prewhich would otherwise be considerable in the aggregate. One of these devices is a butter cutting machine consisting of a receptacle for the mass of butter with a plunger which extrudes the butter through a row of small gates each the size of the individual pat of butter the size of the individual pat or butter served to guests at the table. At the right moment a wire is pulled down, cutting off the whole row of pats. A simpler device eccomplishes the same result in a some what more pleasing manner: a hand im-plement for scraping off "butter balls" from the top of a tub of butter, a single quick movement rolling up a little scroll like a golden rosebud, into the hand of the worker. A cream dispensing recep-tucle delivers just enough cream for one cup of coffee or for a pot of same by a single turn of a faucet which closes automatically when the required amount has been delivered. This appliance saves a few seconds of time; but its principal value is in preventing waste by running over in the rush and hurry of the waiter's work. The French salad dressing dispens-er works on the same principle, but has the additional feature of a stirring devices which keeps the oil and vinegar well mixed in the receptacle so as to insure uniformity in the portions dispensed. Guest ordering fresh-made tea of some particu tion by a tea dispensing receptacle deliv ering an exact modicum of tea leaves by pulling down a lever A pancake batter dispenser for use at the griddle enables an inexperienced boy to produce paricakes of uniform size and thickness.

# The Current Supplement

IN this week's issue of the SCIENTIFIC AMERICAN SUPPLEMENT RAYMOND F. Nailler writes on the art of enameling steel and iron.—In an article entitled "The Modern Car and the Noise Problem," Lewis Kingsley tells us of "little refinements that make for silent running." The adjustment of local time in a large country like ours is a problem of some little difficulty. How it has been solved and how a compromise is struck between theoretical requirements and the exigen cies of practical conditions is expia liarian T. Steison in an article accom-panied by charts and illustrations.— Harold J. Shepstone tells us some interout the bat, the only man esting facts ab mal equipped by nature for flight.—The strategic position of Switzerland is altogether peculiar among European coun-tries, and the movements of the Swiss tries, and the movements of the Swiss army call for most remarkable perform-ances on the part of the soldiers. One of the articles in our current Suprissams describes a very wonderful fest, the march of a line th ree miles long of tors movet employing apout 125 persons march or a the turbe miles long of ropes of the third way of the control of the control



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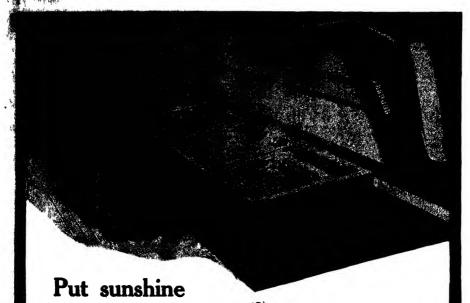
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No. 83 DUDLEY STREET

PROVIDENCE, R. L.



It has been said that a regiment is simply a multiplication of its Colonel. The same thing is true of any kind of management. To multiply himself—to duplicate his own efficiency in every unit of his force—that is the manager's ideal.

So that a manager who is looking for 100% of efficiency in his force must first find it in himself. And to be fair to his force he must first be fair to himself. He must give himself all the chances of generating the fullest man-power.

The head of a sales division in a big western Indiana plant got hold of this idea and applied it with what he at first thought was some success. But he found himself working harder than ever, and the strain began to tell.

It was then that one of the directors happened to introduce a visiting electrical engineer who spent several days in company with the sales chief. By this time the engineer felt free to talk plainly.

"Mr. Blank," he said. "You're a splendid example of energy, but you're not giving yourself a square deal. You're not giving yourself the right help."

"The right help!" cried the manager. "Haven't I got a fine force here?"

"Your people are all right, and you've made them imitate your energy, but neither they nor you have the right help. You're all working, so to speak, with old-fashioned tools. The help you all want is electricity. Yes, I know you've got electric lights — old-fashioned ones in the wrong places. But there are at least twenty ways in which electricity could help you that you're not using—

twenty more people would not help you so much and would only be an additional burden to you. Some day they're going to cut out all that overhead belting and shafting over there in the factory and use motor drive for each machine. Meanwhile you could apply that electric drive principle to the people in your office here. You could apply it to yourself. With the

help of electricity you could do the same thing for this office that cutting out the overhead belting and shafting will do for the factory — make the general conditions better for all, and the particular conditions better for each.

"Let me show you what I mean—and your own case is most important, because if you are alowed down your force is likely to reflect you. Take your lighting. You yourself have poor light. You go after people or send after them, when a button in your desk would do the thing better and save hours of your high-priced time every week. A moment ago you got up and opened your window. A little electrical help here would purify that air fuel your human engines are stoking up on. You're not using electricity for any of the mailing or adding machines—and that clerk who is mounting photographs, for instance, could do it in one-quarter of the time with an electric flatiron. I venture to say that you could accomplish 80% more work here with half the wear and tear if you made use of electricity in even a fraction of the ways in which it can be used."

This plain talk fitted in so well with the sales manager's first thought on the efficiency question that he promptly acted on the detailed advice secured from the engineer, and supplemented by the local electric light and power company. As a result, within a year he was able to compute that without increasing his office charges by a single dollar he was doing much more work and found himself in a position to shorten his own too heavy hours.

Perhaps you who read this have a manpower problem in your own person. Take up the

matter today with your electric power and light company or any General Electric Go. agent in your vicinity. You will find them more than glad to co-operate with you, and no matter how complex your problem may be they have at their command the service of any part of our organization that may be most helpful to them and to you.



# GENERAL ELECTRIC COMPANY

Atlanta, Ga.
Baltimore, Md.
Birmingham, Ala.
Boise, Idaho
Boston, Mass.
Buffalo, N. Y.
Butte, Mont.
Charleston, W. Va.
Charlotte, N. C.

Chattanooga, Tenn. Chicago, Ill Cincinnati, Ohio Cleveland, Ohio Columbus, Ohio Davenport, Iowa Dayton, Ohio Denver, Colo.

Elmira, N. Y.
Erie, Pa.
Fort Wayne, Ind.
Hartford, Conn.
Indianapolis, Ind.
Jacksonville, Fla.
Joplin, Mo.
Kansas City, Mo.

in the World Keokuk, lowa Knoxville, Tenn. Loz Angeles, Cal. Louisville, Ky. Madisen, Wis. Mattoon, Ill. Memphia, Tenn.
Milwaukee, Wis.
Minneapolia, Minn.
Nashville, Tenn.
New Hawa, Conn.
New Crissin, La.
New York, N. Y.
Whener Rills, N. Y.

Gmaha, Neb. Philadelphia, Pa. Pittsburg, Pa. Pertland, Ore. Providence, E. I. Richescond, Va. Rochester, N. V. Salt Lake City, Usak.

For Texas, Oklahogna and Arisona business refer to Southwest General Electric Company Gornerly Holson Blottic Co.) Dalba, El Co. Tours Co. Consultan Brown Rectric Company, Dr. Trousan Co.

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# THE WEEKLY JOURNAL OF PRACTICAL INFORMATION

MILLER SIX ]

**NEW YORK, DECEMBER 6, 1913** 

SLOO A YEAR



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# Pasadena's Beautiful Bridge

# Gracefulness of Line Achieved in a Work of Utility

THE huge concrete bridge at the head of Colorado Street, Pasadana, California, is the lougest and high-est bridge in the Southwest, and by all odds the most beautiful. The roadway is 100 feet above the channel of the Arroyo Seco, a stream flowing beneath the fines residential section of the city, and already highly improved. The nearly completed structure is quite in keeping with its beautiful surroundings, and the fact that it is built on a curve adds to its grace. The length is 1.468 feet, linking Colorado Avenue and a splendid boulevard by a roadway 28 feet between the curis. This will be paved with asphalt and flanked by two fivefoot sidewalks. No car tracks will cross this bridge, making it a perfect pleasure drive with wonderful views up the Arroyo to the mountains

The most striking feature of the bridge, saide from its long, sweeping curve, is the series of noble arches. the largest of which is 223 feet from center to center of ers, while there are two spans of 151 feet and six of 113 feet each. The arch spans consist of two con-tinuous, elastic arch ribs, carrying spandrel columns and in part spandrel walls. These support cross beams The massive piers rest upon the boulders and gravel of the stream bed and are tested to 11,000 pounds to the square foot.

Work has been in progress for more than a year, but a few weeks will see the completion of the important link in the California highway system. From 40 to 100

men have been constantly employed.

Cement to the extent of more than 10,000 barrels was required for the concrete, which is reinforced with corrugated bars of the strength of from 60,000 to 70,000

The cost will be \$300,000, balf of which is borne by Los Angeles County and half by the city of Pasadena. The designers of the bridge are Meesrs. Waddell & Haron of Kansas City.

rington of Kansas City.

As the photographs indicate, unusual skill has been used in designing a graceful as well as a utilitarian structure; in fact, it is one of the few of this sort that

# Flying in Fog and at Night By C. Dienstbach

By C. Diesestach

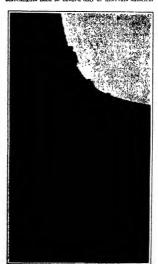
TivE years ago an sir pilot would sacend only
acture carefully studying the wind. A paffy bresse
would so far intimidate him take its would not venture
into the str. All that is changed now. Flying machaines teep from the ground in all weathers. Fog alone
seems a familicap.

The German Kaiser maneuvers of 1912 the greatest continuen was consulted by fog. Scouting both in
the str. Sand on them was completely paralysed. But,
stream assistant than the str. Sand on the str. Sand on the str.

Stream assistant than the str. Sand on the str. Sand

that is reasonably noiseless, there seems to be no renson why fog should prove a serious embarrassment Noiselessness can easily enough be attained with the aid of an efficient muffler. Whatever slight loss of er may be entailed by its use is compensated for by the ability to approach an enemy unobserved. Moreover, the muffler need be used only in the proximity of an enemy or when the crew wish to talk with each

Scouting in a fog very much resembles scouting at night, and night-flying is by no means unusuai Although a strong searchlight must be used to make nocturnal flying possible, the nocturnal scont should nevertheless be able to perform effective work. The searchlights need be theshed only at intervals sufficient



The beauty of the bridge ranks it as a work of art.

is numerous to guide the aviator. Thus used, it may even confuse and demoralize an enemy it certainly does not betray the location of the shifting air scout. So a muffler may be used intermittently with like effect

A flying machine that vanishes in stience and darkness and is heard or seen only at fifful moments can be safely used at night or in a fog. But the muchine must fly low. To fly low it must be very stable, because the wind is usually much disturbed near the ground. Many inventors are now engaged in making the aero-plane stable and safe, so that civilians will not be afraid to use it. The principal military significance of these promised improvements lies in the fact that they will make low flying possible. For war at least the will make low plug possible for war at least the unsafeness of the early aeroplane was not probliditive Soldiers expect to risk their lives, whether it be in the air or on the battlebeld that even the war aviator demands more of a machine than could be fulfilled by the aeroplane of 1908. Above all things he demands stability, not so much because stability means sufety us because it means the possibility of flying low

achine which is capable of skirting the ground and the aeroplane becomes hundreds of times more efficient than a body of cavalry--more efficient in the ability to find its way, more efficient in seeing things in detail, and more efficient in doing service at night and in fog.

Low-flying, however, means not merely stability, but also a reliable motor. Even now the risk of a break-down is less than the danger from bullets. There is no choice of a landing place in case of a breakdown. Hence, the motor must be dependable Some day we that the military aviator can desire

# To Our Subscribers

WE are at the close of another year—the sixty-uluth of the Scientific American's life. Since the subscription of many a subscriber expires, it will not be amiss to call attention to the fact that the sending of the paper will be discontinued if the subsending of the paper will be inscontinued if the sub-scription be not renewed. In order to avoid any in-terruption in the receipt of the paper, subscriptions should be renewed before the publication of the first basic of the new year.

To those who are not familiar with the SCHENTIFIC AMERICAN SUPPLEMENT a word may not be out of place. The SCIENTIFIC AMERICAN SUPPLEMENT contains articles too long for insertion in the SCIENTIFIC AMERICAN, as well as translations from foreign periodicals, the information contained in which would otherwise be inaccessible. By taking the Scientific American and SUFFLEMENT the subscriber receives the benefit of a reduction in the subscription price.

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# NEW YORK, SATURDAY, DECEMBER 6, 1913

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the Editor is always giad to receive for examination Historized articles on subjects of timely interest. If the photographs are units its articles should not and the fact authorized, the contributions will receive speciel effection. Accepted articles with be paid for alreading speciel rates.

The purpose of this fournal is to record accurate simply, and interestingly, the world's progress in so tific knowledge and industrial achievement.

# Lifeboate on Lake Stummers.

SWEEPING legislation that fails to take note of local conditions and other modifying circumstances, is greatly to be deprecated; for it may frequently secure a trifling amount of theoretical good nt the cost of a large amount of disastrous harm. A case in point is a bill which is now before Congress. under which the passenger steamers on inland waters would be required to carry sufficient lifeboats to accommodate every one on board and two able seamen for each boat. It is contended by the Great Lukes shipping peo ple that, if this bill becomes law, the ships will be so lumbered up with lifeboats and so crowded with able seamen, that passenger-carrying capacity will be cut down to such a small figure us to render the ships sitogether unprofitable, and drive many of them entirely out of service.

As illustrating how this able seamen and lifeboat pro vision works out on one of the modern lake ships, we present the following facts: A lake massenger steamer, with a carrying capacity of 8,000 people, such, let us say, as the ship recently illustrated in these columns, carries a minimum crew of 180, all of which crew is regularly drilled in the intuiling of lifeboats, fire pro-tection apparatus, and so forth—life life-saving equipment consists of eighteen 30-person lifeboats, thirty-four 15-person liferafts, and 3,500 life preservers, besides other miscellaneous equipment. Under the pro-posed bill, for the same number of passengers, this ship would be required to carry 115 thirty-person lifeboats and an additional crew of over 200 men known as able seamen and these men would have nothing what ever to do except hundle the ours of a lifeboat in case of disaster. The extra men required could not be provided with quarters, except in the passenger department, and because of the great reduction in the pa ger carrying capacity, due to this invasion of the pas-senger quarters by the crew, and the great additional expense, it does not take the eye of a shipping man to that the chaire of such a vessel earning her dividends would be very remote

Now to one who is familiar with our columns will secuse the Scientifu American of wishing to call a section the present probleworthy efforts to make pas-senger slip travel as safe as the circumstances of the case will permit. We believe, however, that the best lifebout is the ship liself, which, by proper subdivision of her buil and precaution against fire, may be made so safe against any but the most extraordinary of dis-usters, that passenger travel by water shall not only compare favorably, but shall be superior in the matter of safety to any other means of transportation

However safe a ship may be rendered by subdivision and other well known means, it will be always necessary to energy a certain manism of lifeboats. But we believe that in this mutter good judgment should be used, and the number of boats in proportion to passengers carried should be regulated according to the condition which any particular steamship service is carried son No one would think for a moment of demanding that boots shall be provided on the Hudson River steamers in sufficient numbers to earry every passes wer on board.
The proximity of these steamers to the shore on either hand renders such precaution unnecessary Conditions in coast and lake service demand that the number of lifeboats should be increased; but even here we believe

that the question of lifeboat accommodation should have a distinct relation to the nearness of the coast lines to the steamer route. It should be determined, also, by the extent to which the hall of the ship is safe-grarefed against sinking by subdivision with builkheads.

# Goethals on the Panama Canal

E have before us the annual report of Col-George Goethals, Chairman and Chief Engi-neer of the Canal Communication No neer of the Canal Commission, which has recently been submitted to Secretary of War Gartison. It is significant that no definite date is set for the official opening; nor is there any precise prediction as to when ships will make their first passage from ocean to ocean. In the early days of canal construction it was thought that the building of the massive monoit was talegar that the binding of the massive mono-lithic looks would be the determining factor in the question of the time of opening; as indeed it might have been but for the development of slides in the Culebra

The regast states that the canal proper, if we exclude the approaches, machine shops, warehouses and the large occas docks at each end, would have been completed during the last fiscal year, had it not be plated during the last fiscal year, had it not been for the totally unexpected magnitude of the Culebra slides. As for these, no effective way was found to deal with them, except by bodily removal of genetically west hitte of material. Furthermore, the slides and be of material. Furthermone, the summe arms measure in the banks increased in seventty as the cut want down. It was found that the only effective way to deal with this stupendous problem was to excavate and haul away the material from the moving man, until the silder to rest, or until the angle of re-

('ol. Goethals draws attention to the fact that it was predicted last year by geologists that the sildes bad been conquered, and that because practically all the e surface soil and stone had slid off, exposing great ridges of solid basalt rock, this last material would act as a barrier to further earth movement. Nevertheless when all was most promising and the canal excavation within sixty feet of the bottom of the cut on the east side, the rocks broke under the enormous overhead east side. (her rocks bruke timeer the enormous overness up-pressure, and 2,000,000 cubic yards of material moved into the excavation and closed up the cut. The mass was attacked by giant dredges working on the face of the side; and powerful hydraulic monitors, similar to those extensively used in hydraulic mining on the Pacific Coast, were brought into play to wash away the hill from the rear and carry the material into uned valleys at a distance from the canal.

It is explained that water was admitted to Culebra

cut under the belief that the effect of the water in the cut would be to retard the slides, an expectation which was justified by experience obtained belo w the The geologists, on the other hand, the the water might to some extent develop new slides. Furthermore, in 1900, there was much speculation as to the effect of the seamy character of rock on the lsthmus, and it was predicted in some quarters that there might be a leakage of the Gatun Lake through nere might be a leakage or the Gatun Lake through seams and crevices. If those things are table to occur, says Col. Goethals, the sooner the better, if the official opening of the canal is to occur January 1st, 1915; for if the water had not been admitted this fall, but had been deferred until May 1st, 1914, the full height would not be reached until October, 1914, and this would leave little time for the delermination of these ques-tions. Hence it was decided to admit the water at the earliest possible date for getting the dredges into the cut and at work on the slides.

It is gratifying to learn from the report that the it is gratifying to earn from the report that the mechanism of the locks and dams has been tested with perfect success. The gates at Gatun were swung in one infinite and fifty-one seconds time for each. The massive feuder chains, whose dairy it will be to prevent a vessel which has got away from control from crashing lute the locks, were raised and lowered in plenty of time to meet any emergancy of this kind. They demonstrated that they could check or actually stop my vessel, unless she happened to be of very stop any vessel, timess she happened to be or very great size and navring at excessive speed. The electric towing icomordives which will handle the ships in the locks proved their ability to chally tow the largest ve-sels. A successful test has also been range of the electric installation

# On the Unpopularity of Truth

RECENT editorial in these or RECENT editorial in these columns on "Chimer cal Weather Forcoasting" has elicited from or cal Weather Forconstrag' has common from one of our readers an apprendictly eleber, establish from which appear elsewhere in this lanse. Our correspondent asian for another article one the mense suppleted, warning him in no uncertain wags "as to the supplete appearance of the control of the of frauds and unreliable persons who would fast the

of frauds and untrilative persons where season raps; me public, and especially the farmers." Cortainly it is one of the functions of a disease isper-nal to expose both shame and arraver; even though the task is any to be an exceedingly discoursing me one. The

public is provertially found of fining strength delinding itself, and there are specific former and that seem to be subserped with Authority Justice in any extremely and activation and solutions and a first early down they receive at the hands of wheelver the fire seeing of earth and

the cause of truth and common sense.

Not long ago we suppressed an arders desire our respects editorially to a contain sage of American newspapers senset the finite to which publications are addicted in their treatment of photocontons are authors. In the transit is sense printed under the guine of "science" is Sunday supplement; garbled interrieves with science worthies; and the landequate and hancourses received. scientific occurrences in the news commus. One for not indulging this desire was the conscious our own liability to error, and the feeting that in an matters example is better than precept. A more reason, however, was the conviction that the howe

reason, however, was the conviction that the heavingsizes are very recurrently adjassed to the demanded of their readers, and that improvements in the unsterne just reduced to will come to puse automatically us soon as the public evitore a genation desire-fice tileme. An indementing missed of tequity whigh he did:

An indementing missed of tequity whigh he did:

Windries shapes in literature and shorthcatching wases one whit sheard by Thomas-Carlylak distribus consignings these? Or, again: Wishelve any process loss disastic these a surgical operators would combined. Area: of the average man the belief that the weath regulated by the moon?

# The Origin and Evelution of Man

an unfailing interest for all this has passed, an interest which the discovery, in the spring of Interest which the discovery, in the spring of the present year, of the now finnous Pittlown skull has served greatly to situalate. Every such relic brings it sown message from gave bitherto considered to be so far removed as to autedate the appearance of man. The message, however, is written in terms so difficult to decipher that only a gifted few can read it with any automobile to the truth. approach to the truth.

approach to the truth.

It gives the SHERMINIC AMERICAN much pleasure to present in this issue an article by one of the men who have made a life-study of the question. Dr. J. Leen Williams, who has been made a Fellow of the Anthropological Institute of Orest Britain and Irestand in recognition of his contributions to this particular branch of science, has summed up the arguments for the great subquity of man, which have been based upon the more recent discoveries of human relics of amazing but clearly proved antiquity. Although he has been quoted (too often erroneously) in the daily press, the article referred to be his first public protouncement in the (100 often erroneasty) in the many press, res access referred to be his first public pronouncement in the United States. Dr. Williams is arranging to give one or more lectures before our universities and actentific societies, in which he will set forth the arguments by which he arrives at the conclusion that man has been in existence on this planet for at least five hundred

# Sir Robert Ball

UR astronomical readers will have noted with UR astronomical resures will account three regret the death, at the age of seventy-three

regret the death, at the age of seventy-three years, of Nr Robert Ball.

Born in Dublin in 1840, Robert Ball graduated in mathematics from Trinity College, Dublin, and was appointed astronomer to Earl Rosse in 1865. Two years later be accepted the professorable in applied mathematics at the College of Science of Ireland, and later he received a similar appointment from his alms mater. In 1874 he was made astroneers Royal of Ireland. nd in 1892 director of the Cambridge Observatory,

England.

Sir Hobert Ball was very friendly to America, and showed his appreciation of our educational institutions by sending one of his sons to the Massachusette institute of Technology.

Of his works those perhaps but known to our readers are his popular writings, so the sufficient of the Hosvens." The Time and Tide," "Starland," etc. But Hosvens."

these represent merely a by-product of a mind whose main activities were consumed in highly technical ac-

Stations Labor in Public Works.—According to a bulletin of the Bursau of Education, howe in the Induseria (Mide). high select repair the school helicitings for pay, conduct a co-operative school dages for pay, conduct a co-operative school dages for pay, conduct a co-operative school dages for pay and a few n by high solution similar to their even we from plans drawn by high solution similar of a school arctic for the dages of the school arctic for the schoo

# Electricity

The daily pressured that William Marseni had accorded a familiar which the principle meaning across the Rivers the principle meaning across the Rivers to the tensor that desired the proper but shaded the report, but shaded the familiar that inspectional across the property of the tensor that the principle are now thing cannot be to the pressure to be an not make the bear according to the pressure to be an not make the principle of the pressure to be an not make the principle of the pressure that the principle of the prin

The theory German Field Searchlight hangs at the end of a delegating must which is the horizontal position is direct, but as the space delegat in transions it can be sugget holders overlied by sevening a cransk, while another insult, sometic the residual to design out by withdrawing the powers the misses to designed out by withdrawing the powers there are not to be a searchlight, as a light polars in the rais which is excellent for directing the basis mound the horizon. All the operations are quickly mirried out.

"Office-field Bays Not Smitted by Heetiric Lamps.— In relyting a privappear report that "incondensate gas was less hearthd to the eyesight than the electric light on seconds of else ultra-violetrays of the latter," an Smighlat electrical periodical retirentes the fact that since gians of all hinds is organe to these rays no form of incondensent electric lamp having a glass helb one emit these rays mer can any sendang or incorrery vapor lamp in which the light source is inclosed in an envelope of the rayflatency size.

Up-to-clair Fereign Testimeny on American Telephone Service.—A member of the Pittish Partiament who has nades zone study of the telephone services in Cliffsong. Seattle, New York city, and Canada, stated recently that they were distinctly more efficient than the telephone service in his country; although not more efficient, be believed, than the latter would be. England was ahead of the United States in the development of the automatic exchanges of the total value of nearly half a million dollars were heing placed.

Bacquare' Microphone.—The microphone is now used by hurplars for picking combination looks. On turning the look a slight sound is made when the proper number somes apposite the working point, and this can even be heard by a sensitive sex. However, it is impreceptible to most persons, but by using a microphone it is an easy matter to hear the sounds. A suitable form of flat telephone receiver is employed, and it is applied against the asse next the look. A pair of rubber car tubes are used with the telephone. In this way the sounds are insert which allow of opening the look.

As advantage of Terbine-electric Marine Prepulsion.
—The steam turbine shows its highest efficiency at a high speed of rotation, whereas the marine propeller mast be driven at a rather low speed. The problem in efficient marine propulsion by the turbine is therefore how to combine a high speed curbine with a low speed propeller. Two methods of delivering the power of the turbine at reduced speed have been developed; reduction specing between turbine shaft and propeller shaft, and an electric generator driven by the turbine and supplying electric motors on the propeller shaft. An English contemporary points out that although the former solution has been the most widely skepted, it is at the disadvantage that the main power can not be reversed, and speeds turbines must be installed for maneuvering the ship, whereas by the electrical method the entire power delivered by the turbine can be reverted at the propellers.

the entire power delivered by the turbine can be reversed at the propellers.

Time Signals From Elffel Tower—It has now been definitely desided that the Effel Tower shall be used at the center for the world turned distribution solones. The members of the Time Conference shell at Para recently adopted the statutes of the International Association, and fifteen governments have about 1 thesis expected that other states will follow before long. The new association ag attented in Paris and the vireless signals will go out from the Tower twice a day at the determined hours, this corresponding to the Greenwich meridian as corrected by observations set level by astronomers the world over. The jouts all over the globe will receive the time signals said slight, the transmit teem within these own assays, so that in a very short space of himse the hour will be known within one-immdrath of a second. Skips at one which receive the signals will know their bearings willful heity feet. The Queer will be "internationalised" be tone or ownly minutes one yet works because, or during this time needed for the oppositions of "the International bureau, and disting this time it cannot be rande use of for any other artists, every for the government. The choice of the Town was such because it is the best fixed for the presence of the state of the course of the state of the Counter of the Special Life Flowing in expected to flow a highest proposed to flow a highest behavior constituted in the present size the counter of the state and the security.

# Science

Merament to Laplace.—Nulneriptions are being collected throughout the world toward the crecition of a monument to the author of the "Meaning collect" in the town where he was born, Beaumont-en-Auge, France, and toward restoring his tomb. Remittances may be addressed to M. Leprince, avocat, Beaumouton-Auge, Calvados, France.

Cattle for Alsaka.—Special Agent Georgeson, in charge of the agricultural experiment stations in Alaska, is trying to persuade the Government to undertake an interesting breeding experiment with a view to obtaining a race of eastle suited to the rigorous elimate of that territory. His plan is to cross the yak—the domestic ox of Tibet—with Galloway cows.

ox of Theet—with Galloway cows.

Pref. Bearik Mohn has retired from the professorably of meteorology at the University of Christiana and the directorably of the national meteorological service of Norway. He is succeeded by Akael S. Steen.

Prof. Mohn, who was born in 1830, has long been the dean of the International Meteorological Committee, and is one of the most distinguished and revered of European scientific men.

European setentifie men.

A New Pricial Amazeule Expedition is being organized by J. Foster Stackhouse, a well-known English traveler and geographer. The expedition is expected to all from England in the steam yellow it Polaris' in August, 1914, and to spend two years in an exploration of King Redward VII. Land, the region cast of the Ross Barrier discovered by Capt. Scott during his first journey to the Astantic.

The Ventilation of Motion Picture Theaters urgonity demands attention in most of our cities. In Chicago, which has about 600 of these institutions, with a daily attendance of about 500,000, the Department of Health has adopted the plan of issuing certificate to all theaters having ventilation systems of proved efficiency, and urging the public to patronize no theaters where these certificates are not displayed. Let us hope the next object of attack will be the hermosically scaled street-card.

A Balabow Sees Long After Stanet in described by M. Durand-Gréville, in L'Astronomic. It was seen by L. P. Mernod at Sainto-Croix, in the Swiss Alps. spanning a valley between two mountains to the castward, and from a sketch furnished by the observe appears to have been a secondary bow, as fragments of another bow (apparently not a "supernumerary") were seen inside it. A complete and brilliant are was first seen 25 minutes after the astronomical sunset (on September 10th), and portions of the bow were still visible half an hour later.

International Scientific Congresses.— Petermonn's Mutteilungen has published a symposium of opinions from
summont geographere concerning the advasability of making radical reforms in the character and organization
of the international geographical congresses, and many
of the remarks thus elibided probably apply to scientific
congresses and conventions generally. The writers are
nearly manimous in recommending that these meetings
should hereafter be smaller, loss completions, and more
strictly professional. Herecofore the professional gographere attending the congresses have beguinore or loss
lost in a crowd of irrelevant persons, such as diplomats,
pleasure travelers, local officials, and dilettant. One
of the greatest benefits such meetings should confervis., intimate social intercourse between serious students—
is largely nuilfied by the formal character and overgrown size of the usual banquets, recoptions, and the
like. The root of the evil seems to be the conventional
idea that international congresses should be carried
out on an elaborate and expensive scale; in order to rassthe secessary funds the organizing committee is obliged
to woull the semiberably as a much as pessible, and the
local control of the evil general conference of the proposition of the proposition favor of the meeting is diluted in a corresponding ratio.

The Psigrimage to Meeca is still a standing monact to the health of the world, in spite of the analtary precautions adopted by the various countries concerned, including the Ottoman Empire. The American consultance of the Constantinople Amore and the Constantinople Amore and the Constantinople Amore and the Constantinople amore and the collected by the Turkish Sanitary Administration concerning the number of pilgrims who teavied to Meeca are ports of the Red Sea during 1912. There were 88,90% of these, most of whom came by way of Jeddish, and of this number 44,671 had to be subjected to quarantine or other manizary measures. Stassistes of those arriving by the Hedgian Realway and other overland routes are not given, byte it is kepwer that the annual number of pilgrims often exceeds 160,000. In 1912, 198 vees-he were ongaged in earrying pilgrims, of which 134 were Sribtis, 22 Russian, 13-Dukth, and 29 Ottoman. As the see distributed 10,000 from Singapore, and 12,000 from Batavia Frein the Indian George, 28,100; and from ports on the Modifierename, 741; Final the Arabian and African ceasts of the Red Sea, 28,108; and from ports on the Modifierename, 741; Finally three Russian ports of intributed 10,473, of whem 7,002 earns from Sebastopol contributed 10,473, of whem 7,002 earns from Sebastopol

# Aeronautica

Cleaing of Centest for \$100,000 Prize for a Safe Acceptanc.—Entries close on January lat for the big prize of 500,000 frames offered by the Union pour late had Receptan for the best device attached to a heavy-than-aar machine whole when the safe acceptance of the safe and the safe acceptance of the safe acceptance of the safe acceptance as a whole wheeh is considered the safe templane as a whole wheeh is considered the safe templane as a whole wheeh is considered the safe templane as a whole wheeh is considered the safe templane as a whole wheeh is considered the device for a couple of the safe acceptance. Inventors will be required to demonstrate their machines or devices for a couple of months after the closing date of cutties. An entrance too of \$40 is required to the proper acceptance with a complete description of the appear, acceptance with a complete description of the appear acceptance of the proper acceptance of the proper acceptance of the proper acceptance and the period of a few mentals. Earty blanks and further particulars may be obtained by addressing the Accounter Relitor of the pursual.

Latest Results of the Aeroplane in Warfare. -Early last month the aeroplane was used with sucrees by the Spaniards in Morocco and saved a detachment of early the Spaniards in Morocco and saved a detachment of early the was the Aeroplane accompanied by the month of it when the Infante Alfonse channed to arrive overhead in his aeroplane, accompanied by other members of the aerial aquadron. The Moors were an enrified that they field and allowed the survivors of the battle to escape with their wounded. On November 20th, while Leut, Gil Rios and Capt, Barreion were flying over the enemy's examp near Tetuan, Morocco, they were hit and severely wounded, but were able to get back to examp and sight. Lieut, Gil Rios was struck by two bullets, while his passenger reserved one. The height at which they were flying was not stated, but anything less than 5,000 feet is not considered a size elevation in time of war. On November 23rd, as the enjuser "South Dakota" entered the Golden Gate, Silas Christofferson flew over her and dropped a sand "bomb" which struck her sandships. Thus is the first time, so far as we know, that an unitar has succeeded in dropping a bomb on a norming warship

Pergress of the Partis-Catro Flight, Porre Dancurt, the Prench avator who is making a long-distance flight from Parts to Catro, Egypt, arrived at Constantingle on Nivember 9th. He started again on the 15th, and reached Komeh, Asia Minor, on November 24th. Two days later he was overtaken by a storm in the Tauris Mountains and his acroplane was wrecked while making a landing, though fortunately neither he nor his passenger, M. Roins, were nigired. He left Parts on October 21st and hopes to reach his destination before Christians. Another value of the Parts on October 21st and hopes to reach his destination before Christians. Another value of the Parts on October 21st and hopes to reach his destination before Christians. Another value of the Parts on October 21st and hopes to reach his destination before Christians. Another value of the Parts on the Parts of Another States in June 18th. The Parts of the P

Flying Upside Down and "Looping the Loop."—
Sparred on by the accomplishments of Pégund, a number of prominent flyers in Prance, England, and America have lately heen mutating this during Prenchinan On the 15th deci mutating this during Prenchinan on the 15th decided of the Prenchinan of the 15th decided of 1



# The Enlargement of Sculpture

The Pointing Machine With Which the Sculpture at the Panama-Pacific Exposition is Being Enlarged Under the Direction of the Inventor of the Apparatus

By Jay Hollingsworth



 $\mathbf{I}^{N}$  very early times the number of sculptural types was so limited that there was really no need for the sculptor to make n model in clay before beginning to carve a statue in stone or marble. Such variation as he might introduce into his work was rather in th study of detail than in the general conformation of the figure; and aithough he may often have made a sketch in clay of what he had observed in nature, there is no reason to suppose that he worked this into a full-street and complete clay model before he began cutting into the block of marble. When we come to the period of

artistic freedom the conditions are altered Then it seems most likely that the sculp-tor embodied his first conception of a work of art in clay or wax, but that he cut the marble more or less free hand.

The confidence and freedom given to an ancient sculptor by the force of tradition, hereditary skill, and training, as well as by the constant observation of the Hying and moving human form in the pale stra and elsewhere, gave blm a great ad over the modern artist who is mainly dependent on the study of posed Moreover it was easy to obtain the finest marble so that if a block or two were spoiled it did not so much matter. It seems likely that the Greek sculptors of the finest period of urt often worked freely in marble, and it is recorded that Michael Angelo often did so

In times when genlus and inspiration were less frequent, and art was more a matter of academic study we find that the use of finished models became as univer-

sal as it is at the present day -that the form of the full-sized model was transfer by the same mechanical process still in use, and that the method of enlargement was the same laborious method in common use until displaced about ten years ago by the time-saving pointing machine, devised so as to do its work with mathematical precision.

By whatever method, the copying of a model of a statue on a larger scale is done by measured points on the surface, hence it is cuiled "Pointing" by sculptors Points most salient and helpful to the eye in best trace ing the form are selected-the time, the seriousn

finish of the work in hand determining the number of tudate so measured. From time Immer orial this work whether in carving or in building up models in plastic materials for modeling, has been done with dividers und catipers of different shapes and sizes convenient for the measurements to be made. The process of measurpoints by this means requires m skill, and is at best only approximate.

First a series of points, a dozen or so in number, convenient for outlining the general form of the figure or group are selected as bases of measurement and

figure is to be twice the height of the model, each line connecting two surface points (sides of triangle) on the unitrad figure should be twice as long as that connecting the two corresponding points on the model. After the three points are determined, three measurements are required to locate the fourth as well as all remaining points. Further it is desirable that the fourth point be so taken that any two of the three lines con-necting it with master points should be at about right angles. With this in view the skillful pointer so places master points that any point on the surface of

figure or group can be commanded by measurements from three master points measurements from three master points— lines to which make three approximately right angles. Of course to measure all points is impossible, but enough are taken to give a general outline of the surface of the enlarged figure.

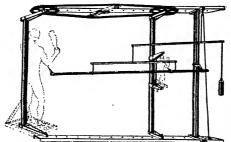
To render measurements from the model into measurements on the enlarged figure, sculptors use a "scale" made in one or another of several ways, all of which em-ploy the principle of similar triangles. one most commonly in use before the whole method was displaced by the po ing machine was a right angled triangle in which the hypothenuse was the height H of the cularged figure, and one side h the height of the model. Measurements on the model will then be taken on lines parallel to h, and the corresponding hypo-thenuse of the smaller triangle will be the desired measurement on the enlarger It is said that a brass plate presumably

a "scale" is still to be found on the base of the Egyptian Sphinx on which are drawn similar triangles. This would indicate that the method of culargement, until so recently in use, is as old as the most socient sculpture. But the marvel is that so laborious a method and one admitting of so much error could have persisted so late in this age of

a movable shaft one end of which is always on a fixed point (at the right in the drawing). Attached to this shaft are two movable arms each ending in a sharp

scientific method.

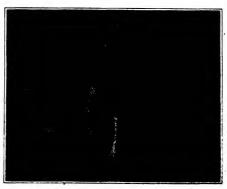
cluded on page 444.)



marked on the plaster model each by a tiny nail with a fine dent pricked in the head for receiving the point of the dividers. Minutest care must be exercised in placing these "master points" and in finding their corrending points in the enlarged figure, as the exactness of all the measurements depends upon their accuracy. The first point on the enlarged figure is placed arbitrarily, the second by one measurement, the third by two measurements. These three points determine a tri-angle similar to the one whose vertices were the three master points on the model. That is, if the enlarged



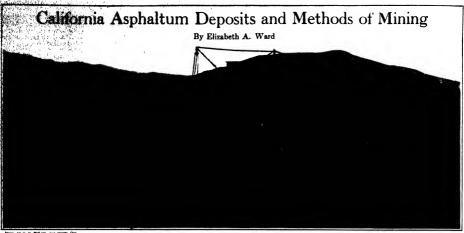
Building up the clay core for the



Using the machine to locate points on the enlargement corresponding to the



The state of the said



con up to the Melines, Compensation Car

Becently opened mine of soft asphaltum at Carpenteria, California, showing a part of the deposit stripped of soil, and the depth both of soil and deposit.

THE sephsitum deposits of California are confined to a narrow strip of territory near the coast and extend, broadly speaking, from Ban Francisco on the north to Los Angeles on the south. They consist either of andstone impregnated with bitumen, or of asphatic oil mixed with sand. In common parlance, the former taked spatialism, the latter soft, a condition due in the one instance to loss of volatiles and to their retention in the other. By far the greater part of California

amphatium, aside from her extensive fields of asphalite oil, is in the form of bituminous rock and the percentage of pure asphalitum is remarkably uniform, averaging from fifteen to twenty per cent. Geologically, they belong with one exception to the Miccene epoch. In all this five-hundred-nile extent containing large areas of bituminous deposite hardly more than half a dosen districts have been opened up for mining on a commercial scale and the product has been utilised almost entirely for local needs.

The district where the greater part of the mining has been done are Santa Cruz, about fifty miles south of San Francisco: San Luis Obispo, two hundred miles further south; and several different sections of Santa Barbara County, a hundred miles on down the coast. Ventura and Los Angeles counties contain large Belds

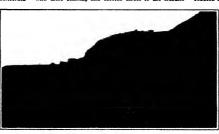
large area in Kern County, but asphaltum in the common acceptance of the term does not occur here to any large extent and very little mining has been attempted.

arge extent and very fittle mining has been accupied.

The Santa Crus deposit, situated eight miles west of
the city of Santa Crus, corers an area of five or six
square miles and was opened up thirty-five or forty
years ago. It occurs in a marked beit about fifty feet
thick at an altitude of eight or nine hundred feet near

MADE BANKER TO BE CONTROLLED

the top of Empire Ridge. This outcropping is covered by from fifty to one hundred feet of distonanceous shale, and it is of a dull gray color, the result of fading through long exposure to the elements. The freshly broken product is glossy black or brown. The mining process consists, first, in stripping it, that is, in removing the shaly covering. This is done with dynamates and scrapers. Then the suphairum is loosened with more blasting and carried direct to the steamer



View showing the working face of bituminous rock deposit, Santa Crus

landing, whence it is shipped to San Francisco and adjacent cities to be converted into pavement. The annual output varies from thirty to sixty thousand tons

annual output varies from thirty to saxy mousant tons.

The next section, San Luis Obispo County, contains an immense deposit of asphilium estimated at eighty aquate miles of surface with varying depths, reaching a maximum of two hundred feet south of Arroyo Grande. While it is smoog the best sprearing biru-

minous rock in California, the deposit has been very little develored. Twenty or more openings have been made, but most of them have been idle for a long time. One that has been actively worked, known as Weng Quarry, southwest of the city of San Luis Oblepo, is located near the top of a mountain ridge, and like the Santa Cruz product, it is hand and is mired at the face of the cilff by blasting as before described. It is then reduced by cooking in burge doubte boller arrangements,

or else steamed until it attains a mealy consistency that can be spread for paving purposes.

purposes.

Santa Barbaru County contains numerous deposits, some of which have been uncovered while others have been uncouched;
probably many are undiscovered. One
that was worked for a time and then
nhandoned, is a few miles from Casmalla
and contains a very rich as well as uneven percentage of pure asphatium, ranging from twenty-nine to staty-sight percent in the same deposit. Another is near
Los Alamos, in the central part of the
county, where there are three nearly
parallel mountain ridges, the middle one
of which is the location of what was about
fifteen years ago one of the most axienvive and interceting asphatium mines, not
only in California, but in the world. It
was known as the Slaquee mine, named
from a creak near by. This, like the doc-

posts aiready described, is near the top of the ridge, and the suphistum is hard and was obtained by the usual arripping and blasting processes. The extent or the deposit has never been determined, but it is known to be a big one. A large amount of machinery was ministalled at great exposes for developing this mina, for besides cable curs to carry the product the short distance to the reducery it was necessary to devide order to state to the reducery it was necessary to devide some



They shoulding deposit of hituminess spet man fine Luis Oblopo, California.



View of complete working face of bituminous rock deposit, Santa Cruz, California.

means of preparing it to be transmitted to the nearest shipping point. The scheme evolved was to extract the pure asphaltum by distillstion and then to mix it thoroughly with naphtha and pipe it by a gravity line to the nearest steamer lauding thirty miles away. Here the naphthu was recovered and pumped back to the mine for use again. The enormous expense of installing and maintaining the plant proved prohibitive and the alue closed in a few years

Au interesting feature of these mines is the pre

in the bituminous rock of large quantities of fossil shells, both gasteropods and bivalves.

Along the beach both east and west of Santa Barburn, there are bold outeroppings of asphaltum, and of this region the United States Geologic Survey report of "it cannot but be regarded nent in the oll-bearing nature of its rocks and the structure which has permitted its liberation." Of the two west of the city, one at More's Landing lies in a great cliff above the beach and has been worked but little while another at La Patera, near by, was at one th an important mine. Several fissures here extending slong the shore about an eighth of a mile are filled with asphaltum and have been opened to a depth of perhaps two or three bundred feet. This, too, is hard and brittle like the other deposits, and yet it has a tendency to cose up from the floor of the shafts, espe-cially below the hundred-foot level. It has been estimated that the amount of seconge collected in one of the shafts in a year's time was equivalent to a mass of asphaltum twenty feet in depth and of the length and width of the shaft. This tendency has made it impo-sible to penetrate to any depth in any of the veins because of the inevitable destruction of the timbering. This was among the earliest mines developed in the county and idek and shovel were the principal

About the same time that the mines of La Paters ed, another deposit of a different charac

was opened up at Curpenterla, twelve miles east of Santa Barbara. This was a low bed of soft asphaltum severa square acres in extent, alongside of the beach beneath a few feet of sandy soil.

A huge pipe line was laid into the surf order to strip the deposit by hydraulic means, a process that proved much more expensive than the other method. The asphaltum was then mined by means of hot shovels, the men working in an amphitheater of tiers of steps, cutting down each tier in sucsion and at the same time creating new ones. The shovels were heated by means of portable furnaces and cable cars carried the blocks of asphaltum to the reducery, close at hand, where the sand and volatiles were removed preparatory to shipping. After the varivats and stills had done their work the rich black pitch was poured boiling hot from great swinging caldrons into barrels that carried it to all parts of the country. The mine was worked the most of the decade from 1890 to

1900, and then a large part of the machinery was transferred to the Sisquoc in the belief that the new venture would pay better. Ever since then the Carpenterla mine has lain idle.

A year ago, however, another extensive soft deposit A year ago, nowever, another extensive sor, deposit, half a mile distant, and uncharted by the Geological Survey, was prospected with the result that it has proved the most perfect road making asphaltum yet uncovered. It was once an oil lake that became entirely absorbed by sand that drifted in in almost the precis percentage of course and fine material required. It runs something over twenty per cent pure asphaltum, so that approximately only ten per cent of mineral ag-gregate needs to be added for road making. The average daily output varies slightly with the temperature use duly output varies slightly with the temperature of the air, as a warm day very perceptibly softens the aircady soft deposit and the viscous mass can be cut much more easily. At Trindad, on the other band, the men are required to work at night while the materiol is brittle

ai is brittle.

Besides natural asphaltum, California produces a nescioes naturni asponitum, Chitorina produces a large amount of the refined product. A large refinery for this purpose is located at Point Richmond on San Francisco Bay, and the oil is piped from Kern County, two hundred and fifty miles distant.

Three still more extensive plants are located in San Lais Obispo County, where local oll is utilized, and oll from wells as far distant as one hundred and fifty Heat is introduced through steam coils heat to from two to seven hundred degrees, depending upon the percentage of volatiles to be retained. In propor-tion as these are driven off the product loses its clasticity, hence the refined asphaltum is lacking in some of the qualities necessary to a good pavement. The life of the refined product is from five to seven years as

against fifteen to twenty years for the natural produ A place of natural asphalt payement laid in Santa Bar bara over twonty-five years ago, where traffic has been constant, is still in excellent condition, and it has received hut little repairing during this period.

One reason that there is no greater activity in Cali-

fornia asphaltum mines is the great cost of transporta-tion, with the result that Trinidad continues to compete successfully with us in the eastern markets. Her importation to the United States in 1911 was nearly 112,000 tens, and of our total domestic production the same year, 350,000 tons, California contributed a good same year, source took, cancerna contributed a good margin over half. The principal reasons, however, that so little mining is being done in these fields is the ex-pense connected with it, and the very limited demand for the asphaltum. When readmakers become more familiar with the durability of natural asphalt pavements and when the good roads movement gains greater momentum, it may be expected that California deposits will enter upon a new era of development.

# Automatic Wireless Train Control

By F. C. Coleman

CONSIDERABLE interest is being taken in an in-stallation of wireless automatic train control which has been laid down on the Hampton Court branch of nas been laid down on the manpion Court braisen or the London and South Western Railway Company. This system is somewhat similar to that which has been working for some time on four sections of the down line and four sections of the up line of the Canadian

Pacific Railway, near Toronto.

Under this automatic system of wireless train control invented and patented by Mr. Frank W. Prentice, a current of high frequency is sent along the line by means of a wire laid in the four-foot troughing on epers. This wire is known as the wave wire and it acts on an arrangement of antenna-technically known as the harp-which is on the locomotive, and is

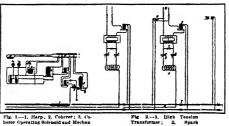


Fig. 1.—1. Harp, 2. Coherer; 3. Coherer (pprating Solesold and Mechaniam, 4. Detector Helbr; 5. Time Eiment Relay; 6. Master Relay; 7. Whitatie or Busser Nolesold; 8. Brake Valve Solesold, 9. Hold Reig; 10. Push Button; 11, Has Hare; 12. Sturage Battery, R. Red Light, 6, Green Light;

Track Transformer, 7. In-sulated Ball Joints; 8, Wave Wire; 9, One Hun-dred and Ten Volt, Sixty Cycle Feed Wires. Diagram of connections of the automatic wireless train control

Transformer; 2, Spars Gsp; 3, Condensor; 4, Heltz, 5, Track Briay; 6, Track Transformer, 7, In-minted Ball Joints; 8,

composed of nine wires. So long as the harp is receiving energy from the wave wire, a green visual signal is given in the cab of the locomotive. The high frency current enters an apparatus box at the end of the section, and its primary is controlled by a relay one section, and its primary is controlled by a reary connected to an ordinary track circuit. This relay, in accordance with the principles of track circuiting, now so well known, is de-energized when a train or part of a train is in the sectiou, and this causes the flow of the high frequency current to cease. The harp now no longer receives its energy, so that a relay on the loco motive is closed, and this causes the green visual signal to be switched out and a red light switched in. The brake is automatically applied simultaneously, and a

nrake is automatically applied simultaneously, and a whistle or buxer may also be sounderformer for the track circuits and one for the high frequency current, a spark gap, condensor and helix, also the relay, stready referred to, connected with the track circuit. Ou the otive, besides the harp, there is a coherer which is continuously recked—about eighty times per min-ute—by a solenoid and co-operating latch device. Work-ing in synchronism with the coherer is a relay controiled by a time relay, which in turn controls a mast relay. The time relay is provided to allow for decohence The last-named controls in its turn the solenoids used for operating the whistle and brake valves and ence the red light. A push button is provided to allow the driver to release the brake should the train be pulled up at an unsuitable place, but this does not switch out the red light.

The diagram of connections illustrated herewith setforth in greater detail the main features of the syste which has been outlined above. Fig. 1 covers the non ratus on the engine, while Fig. 2 includes the co-operat

ing arrangement of the track. The latter may present first attention. The track density is self-from agreement able source of supply 8—in this case 10½ with the track alternating current—through the transferance 6. The secondary is connected to the runting rathe, which are divided into the signaling sections, as essail, by feed intel joint at 7. The track circuit of one section pleases lated joints at 7. The track circuit of one section passes intrough the relay to fit he section behind, so that the presence of a train or vehicle causes short circuiting, thereby releasing the relay 5 for the section in, which the 'danger' intinaction is to be given. The high frequency plant, the primary of which is controlled by the relay 5, includes the transformer 1, spate; gap 2, condenser 3, and helix 4, and is of any satisfable character as long as it supplies the required high frequency current to the wave wire 8. It will, therefore, he seem that the wave wire 8. It will, therefore, he seem that the wave wire 8 continues to raceive high fr current unless the de-energising of the generaling track circuit relay by short-circuiting causes its cossition. On the engine, the harp 1, Fig. 1, transmits radiant

energy received from the wave wire to the coherer 2. This is, as has been explained, continuously rocked by means of solended 3 and its co-operating lated device. Relay 4 operated in synchronism with the coherer 2. being closed as the waves from the harp break down the resistance of the coherer and reopened as the resist-ance is re-establishd. Its closing completes the circuit ance is re-establish. Its closing computes the execut of relay 5, but as the latter is of a clowly de-energising time design, it holds over the pulsating action of the relay 4, causing continuous action of the master relay 6 as long as the influence of the high frequency waves on song as the moment of the sign requestry waves from the wave wire are felt. The meater relay 6 con-trols solenoids 7 and 8, respectively, which are used for operating the whitch and brake valves, and also the display of the red or green light. The latter is continuously presented, while the high frequency waves are being received, but immediately the influences is lost, the green changes to got the brakes are amounted and are being received, but immediately the influence is lost, the green changes to red, the brakes are applied, and a whistle or buzzer is caused to sound. The holding relay 9 for the brake system is fitted

with a push button 10, whereby the driver can release the brakes to con-trol the running of the train at discretion through the remainder of the sec-tion; but the red indication continues to be displayed, and the whistle or buzzer to sound so that the driver cannot possibly ignore the warning he has

If the section shead becomes clear whether the train is standing or is still moving, the corresponding track circuit relay is again actuated, re-establishing the high frequency circuit, and thereby restoring the indicator, brake and whistle or buszer relays to "line clear" conditions. It is pointed out, the that (1) the driver receives a persistent "danger" indication, in combination with initial brake application; (2) subsequent action at discretion is only permitted in conjunction with insis warning; (3) he is informed of the restoration of "line clear" conditions; (4) the apparatus involves the positive

maintenance of a "line clear" indication, in combina-tion with positive action in the event of "danger," failure or other adverse conditions. The automatic character of the installation is also emphasized by the inventor, who urges that it enables a line to be worked ventor, who urges that it enables a use to be worker to its full traffic capacity, there being no loss of time during the transmission of bell signals and the mechani-cal operation of a number of levers. It is claimed, also, cal operation of a number of levers. It is cistumed, also, that in case of fog a driver is given all necessary information as to the conditions sheed, even if he cannot see any of the fixed signals; that in circumstances where it is difficult to give a good look shead, owing to the layout of the line, the same advantages are resized; and that the installation mosts all requirements as regards asfeguards against the non-observance of signals. combining, ip., fact, the development, of the track circuit, now so strongly recommended in many quarters, with the direct signaling and control of trains. quarters, with the direct signaling and control of trains It has been shown in regular working that the effect of another engine on the section was sufficient to me of another engine on the section was sufficient to pull up a train against full steam, and with the regulator

# mburg University Extended for Science

THE new university at Hamburg is an extension of the important colonial institution known as Kolon-It the important colonisi, institution known as Kolon-inilizatitut which was founded in that city at a previous date. The university is to have chairs of philosophy, law and colonial sciences, and the annuar bodges will be 2590,000 marks. Upward of 15,000,800 marks will be expended for the construction of the respons institu-lings, comprising the different institution amount in the university. One of the interesting features is the uni-versity extension scheme which provides public and from evening courses.



Mayor Alle

# SCIENTIFIC AMERICAN

# Carreamondence

The silitors are not responsible for statem with in the correspondence column. Amongmous minimizations council be opinished, but the name conspondents will be withheld when so desired.]

# To Strike the Pentagram

To the Editor of the Scientific American:

The method of striking the pentagram or pentacle, prepased by Mr. John P. Robinson in your issue of prepared by Mr. John F. Monison is your issue of Keewither 22nd, is legatious, but less accurate than the old-fashioned way of dividing the circle. This will appear to anyone who will carefully measure the draw-ing shows, or will attempt to construct the figure from

ling shows, or wait statempt, to consists of any of the directions given.

In your drawing the lines 1—2, 1—5 and 2—6 are of equal length, but the lines 4—5 and 4—6 are longer than the others (and of course the spacing of the points is unequal), and this will be the invariable result of following Mr. Robinson's plan. This would not be a very serious matter in laying out stars for lawn coration and similar purposes, but nnless the primary es are exactly perpendicular to each other, the irregu larities above mentioned will be increased. More there are better ways.

he draughtsman has his own system of producing the pe entacle, but for the man whose needs are le exact, the following plan will yield a very close approxiexact, the following plan will yield a very close approxi-mation. Strike a circle whose diameter is eighty, or some multiple or divisor of it. If the dividers are now set to forty-seven eightieths of the diameter they will almost exactly divide the circumference law five parts, and the points, when properly connected, will form the star.

This is sufficiently accurate for any ordinary work, and may easily be performed in the fol lowing man To divide a circle of, say, 20 feet in diameter, take a light strip of wood 12 feet long, and having fixed a center-pin at one end, drive a long nail 10 feet from it, and with this strike the circumference. Now one eightieth of 20 feet is one quarter of one foot, or 3 inches, and forty-seven eightieths are, of course, 11 feet and 9 inches. Remove the nail, therefore, and drive it that distance from the center-pin, and placing the latter at some point on the circle, scratch across it with the nail. Place the pin at this point and repeat the operation, and so on. If carefully done, it will be found that the variation is a negligible quantity. Small nine may be driven in the proper places, and a chalk-line stretched from one to another will produce the figure desired, without resorting to the "cut-and-try" method formerly in vorue.

uppose, as another example, a farmer wishes to cut a star-shaped ventilator in the gable of his barn. Let him strike a circle of (say) 10 inches in diameter. Ten inches contain eighty eighths, and by setting his com passes to forty-seven eighths (5% inches) he can re-ily divide the circle into five equal parts.

In using this method it is better, when practicable, to take one of the ordinary divisions of the carpenters' rule (sixteenths, eighths, quarters, halves, or inches) as the unit of measurement, and eighty times this unit for the diameter of the circle, as it facilitates finding the fraction (forty-seven eightieths) necessary. This plan has no advantage over the older one of pricking off the circle, except that it is more expeditious. It is only necessary to remember that forty-seven eightieths of the diameter of any circle is almost exactly seventytwo degrees of that circle, and this fraction will serve for laying off pentagons or pentacles when-lute accuracy is not required.

Day

New Brighton, Pa.

# A Suggestion for Government Automobile Road

To the Editor of the SCHNTIFIC AMERICAN:

As the question of Government road building is like, to be discussed in Congress this winter it might be

a good idea for opinions to be given as to what kind of roads the Government should build or assist to build. I think the Government's chief interest in road building is in the more important roads which should run ing is in the more important roads which should run from the principal seaport cities to the principal inter-lor cities. The first road to be built should start from New York and should be surveyed near the Hudson of River, the Rite Canal, the Lake Erte shore, then on to Chicago, and from there on to New Orleans see St. Louis. Such a road should have no grade crossings Louis. such a read should have no grade crossings and should have a surface width by not less than 100 feet, the central portion should have a finished surface at least 25 feet wide built as well as the best city street, the 'remaining width on each side should be dragged the remaining width on each side should be drugged and kept as uncot as possible and rested with oil or office preparations which experience might prove to be best fer impriving each roads. The object in having wilds roads would be to give plenty of room to avoid accidents. As a further precention there should be no loading or unloading of freight or passengers on the

Beile Brans & O. H. 1997

right of way. This should be done on the outside on ground provided by the cities for this purpose. Also the wide road would encourage the building of

wider automobiles with more wheels under them which would increase their carrying capacity.

The method of building such roads would be for the Gevernment to let the contracts for the grading; cul-vert building, fencing, and finishing the road, to coryear tending, teneng, and mining her road, to cor-portions. After the completion and acceptance of the work the Government should charge a toll to users of the road sufficient to pay for maintenance and a low rate of interest on the investment. In this way the nent would borrow the money to huild the road and then collect the interest and cost of maintenance from the traffic, which is precisely the way it proposes to do with the Panama Canai, a method which is fair eyond all question

This system of Government roads might be regarded as complete when a sufficient number of roads were built to take care of the interstate commerce. It might erce. It might be proper for the Government to contribute a small sum per mile for dragging the roads on the rural routes, but further than this I can see no justification for Gov-Ment uld

I wrote a letter to the Scientific American which was published in the November 30th, 1912, issue on the subject of "Antomobile Toli Roads" such roads to built and owned by corporations, allowing automobiles to use the road by paying tolls. Such roads would be excellent feeders for the Government toll roads, or the States could build their own antomobile toll roads just the same as the United States Government could, as explained above. A system of Government toll roads such as I have suggested I think should be used exclusively for automobiles, because the Government would re particularly interested in interstate commerce and interstate commerce is only possible on public roads when the automobile is used. Such a system of Government roads would also be valuable for rapid maneuvering of Proops in case of war.

Stanberry, Miss. Clifton R. Summers.

# Automatic Pilot for Signal Observation

To the Editor of the SCIENTIFIC AMERICAN:

Much is written these days about railway accidents their prevalence and their prevention tions of various character have been made and experi-ments have been carried out, yet the appailing death rate is not materially decreasing

According to some writers, the ideal prevention of accident would be to take the flual coutrol out of human hands and to make same entirely mechanical But the automatic stop will never reach such perfection that it cannot be tampered with, or that it can become abso lutely dependable in all emergencies. What manner of automatic stop could have prevented the collision with the huge boulder on the irack of the Chicago, Burlington and Quincy near Genoa, Wis., on the morning of November 3rd, when the train was wrecked and six men were severely injured?

e remedy lies not in perfecting automatic co but in making the human factor more efficient. Iu line with this thought I would make the following sugges-

On top of every railway locomotive, immediately be-hind the headlight, there should be constructed a small windowed cable or observation room, containing a cor seat for one person, whom we may call th pilot. Upon approaching or passing a signal the pilot would be required to touch a button or series of buttons which would register the fact that the signal had observed. The engineer would have a similar set of buttons to register the same signals. As the two observers could not communicate with each other to compare notes, there would be no dependence upon one another, and the reading of the recording instruments cials would be a check on th e watchfulness of both the pitet and the engineer. Further than thus recording signals, the engineer's duties would be in no manner changed from the present duties of an engineer. The pilot's cahin should also contain levers for emerg-ency control, so that should the engineer fail to observe a signal or to notice an obstruction, the pilot would be to bring the train to a stop.

An accident through negligence in observing algoris An accurate trough negigence in observing against would become practically impossible, as there would be two observers instead of one, and both would be more cureful than the engineer of the present, because the observations of one would be a check on the observations of the other, and neither would dare to let a signal unnoticed, through fear of the penalty.

plate unnoticed, through fear of the penalty.

The expense of multiabling such a system may seem exceeders, but this cost would probably be offset by the saving in rolling stock and lawanits, and the saving of the public demands that the railroads work for safety even though it should make extra expense.

The objection may be raised that the public's position so near the front end of the locomotive would be very perious in ease of accident, and that no one would want the job, Under the new conditions thus created the

pilot's position would be safer than the engineer's is at present; and, furthermore, a study of the matter may point out some better plan for attaining greater safety in this respect.

# Weather Prophets

To the Editor of the Scientific AMERICAN:

For many years I have been almost a constant reader of your valuable journal, and its timely articles are very much esteemed by a host of others besides myself As 1 am after sowing, planting and reaping, your article on weather forecasting, under date of November 1st, 1913, naturally struck my eye

What I did hope to find was a reliable forecast for say the next sla mouths; but you only hint at the schemes of the charlatan, the delusion of the crank and vaguely to some method in the madness of the honest ignoranous which enables him to find a incrntive market for his prognostications, etc

Whether you had in mind the Hackensnek weather prophet does not appear; but I saw it stated some years ago, on good authority, that Mr. DeVoe did not only sell his predictions to the farmers of the United States, especially those located in the West, but that he also supplied residents of foreign countries with his prog-nostications, presumably for a good price, if memory serves me right.

The old saw, "Give the Devil his due," may be appropriate, and as an honest, hard-working, natural-born citizen of the United States, I heartly indorse holding up to the limelight the mischievous doings of frauds. charlatans, ignoramuses, or canaks

Had you more definitely pointed out the activities

of such persons, by in some manner illustrating or demonstrating the schemes of frauds and charlatans, you would have done the general public-your patrons—a service, a favor; else how shall they be forewarned against parting with their money for what is worse -absolutely useless?

I, for one, should like to be thus posted and would appreciate very much another urticle on the same subject warning me in no uncertain way as to the scheme of frauds and unreliable persons who would fool the public, and especially the farmers E. Kozez Asheville, N. C.

# What Dr. Lardner Said About Steamships

To the Editor of the SCHNTIFIC AMERICAN In your editorial of November 15th, "The Future of

the Dirigible," you speak of the commonly accepted story that Dr. Dlonyslus Lardner proved mathematically In a paper before the British Association that it would sible for a steamship to carry enough cont to propel her across the Atlantic Ocean

As at that time stemmships had already crossed the occurs, I was interested and looked the matter up, and had the good fortune to find Dr. Lardner's original It proved, as I anticipated, that he never made paper the statements popularly attributed to him. What he really said was that in the state of steam engineering at that time it would not be commercially profitable to run n line of freight steamers between Li lverpool und New York, which was perfectly true—lie not only recognized the possibility of such a line, but suggested their use in the curringe of passengers and express

Since his day the invention of the surface condenser, the compound engine, the high pressure marine boller, and many other improvements, have revolutionized commerce and driven suiling vessels from many trade routes, except for the carriage of very heavy and balky freight, like coal, inmber, etc. It is only fair to Dr. Lardner's well deserved reputation that this error should be corrected, especially us the story is often used In connection with the exploitation of Keety motors and other scientific swindles, as an illustration of the un-reliability of scientific loyestigators, and the worthless Haverhill, Mass

International Safety-at-Sea Conference.-The Inter national Conference on Safety at Soa, which was formally opened on November 12th, is now in session at the British Foreign Offlee, London. In a message of welcome King George, who once commanded a British cruiser, says in part. "The question the delegates are about to consider is one in which I take a special interest, for it affects closely the lives and welfare of a vast number of my subjects; and as a sailor I have had personal experience in many of the matters which will come up for consideration by the Conference." The gathering is presided over by Lord Mersey who, it will be remembered, was the president of the British com-mission which investigated the "Titsuic" disaster. The twelve nations represented are the United States Great Britain, Belgium, France, the Netherlands, Russia, Denmark, Germany, Norway, Spain, Canada and New Zealand.



Fig. 1 .- Pithecanthropus



Three skull caps from the Neanderthal race

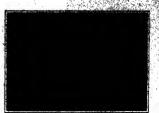


Fig. 8.—The Spy chall No. 2.

# The Origin and Evolution of Man

# Recent Views Suggested by the Discovery of the Piltdown Skull

By Dr. J. Leon Williams, Fellow of the Anthropological Institute of Great Britain and Ireland

If very widespread publicity on the part of the press is a fairly accurate measure of general interest in a ct, then the prominence and space accord recent interviews with me on the theme of prehistoric man indicate something more than mere curlosity on the part of the public. It has also been very interestto me to of erve that nearly all of the different parts of the country that have mentioned the subject have given special prominence to the statement of the great age of man on the earth. That is really one of the vital aspects of the whole problem of man's ecent discoveries have made it quite plain that the human race has been in existence for a much longer the numan race has been in existence for a much longer time than has generally been supposed by the major-ity of scientific men. The only alternative view that can now be taken is that evolution has not proceeded altogether along the lines of the Darwinian hypo-

Editors of the Scientific American, to deal with cer-tain phases of the subject which bear directly on this great problem. The main features of the Darwinian theory of evolution are too well known to the readers of this paper to require elaboration. They can be largely summed up in the two terms—variation and satural selection. The causes of variation are still obsoure; but the working of natural selection is patent enough to any observant and thinking person. nature of the environment exercises a profound modi fying effect on species, and it is highly probable that this factor in evolution played a much more important this factor in evolution payed a much more important part in the past than in the present. But all of these factors of the Darwinian theory work in a very slow way. Dr Alfred Russel Wallace told me, in an interw I had with him last July, that he did not believe a single new species had come into existence during whole Pleistocene era, and this, according to Penck, the great German geologist, covers a minimum period of 500,000 years and may possibly extend to 1,5

Accepting even the lowest estimate, one of two things is evident: either the conditions for the production of new species are much more unfavorable in recent than in early geological times, or Darwin was right in his earlier views that enormous periods of time were required for the production of species. But there is now in the field another school of evolutionists, led by the eminent totanist, lingo de Vries, who believe that species may appear quite suddenly. This has certainly species may appear quite suddenly been fully demonstrated in the vegetable kingdom, but peen runy aemonstrated in the vegetable kington, but Wallace regarded these as fresk or, at least, exceptional productions, which in no way militated against the fundamental principles of barwin's teachings. I will try to present very briefly, some of the evi-

dence now in our possession bearing on these two theories as applied to the origin and evolution of man. Prof. Arthur Keith, Hunterian Lecturer on Anatomy at the Royal College of Surgeons in London and anthor of "Ancient Types of Man," says, in describing a preor "Americal Types or Main, 8308, in describing a pre-bistoric skull found thirty feet below the surface when the great Tilbury docks were evenyated in 1888, and estimated to be between fifteen and thirty thousand years old, "In Owen's time those scientiats who had come, under Darwin's influence to believe to the evolution of man, expected to find to an individu ancient as the Tilbury man some distinct trace of his similar origin." But this skull was purely modern to type with no ape-like characters in evidence years later, across the river from Tilbury, the now years after, across the tree those kindless, the so-celebrated Galley Hill skull was unearthed in a high terrace of the ancient Thames. Prof. Keith asks for about 200,000 years<sub>spe</sub>as the age of this skull. Here again we have a specimen which although a little more

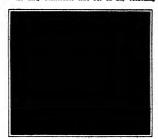
"find." is still essentially modern.

if, therefore, we find the modern type of man in existence 200,000 years ago, it becomes perfectly evident that we shall have to get very far back in the past to find that human relative of the anthropoids from which we have undoubtedly descended.

Let us for the moment leave these ancient records

Let us for the m of modern man and turn our attention to another and distinct group of discover

in 1891 Dr. Eugene Dubois, Professor of Geology in the University of Amsterdam, found on the banks of the Bengawan, at Trinil, Java, the top of the skuli, two molar teeth and the thigh bone of a creature presenting characteristics which placed him in a position about midway between the highest ares and the lowest human beings heretofore known. The estimated size of the brain was 900 cubic centimeters, that of the largest gorilla being 600 cubic centimeters, while the lowe Australian savages have a skuli capacity of about 1,200 cmbic centimeters. These facts and others of like nature led Dr. Dubois to give the name of Pitheomthropus creetus, or ape-man, to his Java discovery. There is still a difference of opinion as to whether these fossil remains should be ascribed to the late Pliocene or the early Pleistocene era; but on any reckoning



Dr. Woodward's restoration of the Pilt-down skull.



Fig. 5. Restoration of the Piltdown skull cording to Dr. Williams.

they are probably the oldest and most primitive hus relics discovered up to date. On the basis of Penck's measurement of geological time they are more than 500,000 years old.

In a rocky ravine, known as the Neanderthal, near Elberfeld, Germany, a few miles from the Rhine, there was found in 1887, in a cave, the upper part of a skull about which a fierce scientific controversy raged for Virchow, the great German anatomist ologist, maintained that this could not be and anthrope and antiropologist, maintained that this credit not be the skull of a normal human being. But the subse-quent discovery of more than twenty skulls of the same seneral type proved that Yirobow was quite wrong. The discovery of so many skulls of one ancient type, extending, as key do, over a great stretch of time, is one of the most important features of our knowledge of principles. primitive man. Let us compare three or four of these

We may take that wonderful skull known as Man of La Chapelle-aux-Saints" as typical of the race. We see at a glance that we have here to deal with mething altogether different from the modern type man. Aithough the head is of great size with a larger brain capacity than the average modern man the skull has very marked anthropoid features. forehead is very low and retreating; the brow ridges above the eyes are very heavy and projecting; the eye sockets are enormous in size; the nasai opening indicates a very large, broad, flat nose; the jaws are prog-nathous with a markedly retreating chin.

Belonging to the same race as the man of La chapelle-aux-Saints are the skulls found at Spy, Rel-

we take the skull cap of the Java ape-man and place it beside those of Neanderthal and Spy, we see that the chief characteristics are the same in all of them, but that there has been a gradual increase in size, an evolution from the earliest Neanderthai man to the later man of La Chapelle. That they all belong to the same race is evident when we look at Prof. Boule's tracings in which they are all compared, but we see that there has been great brain development from the Neanderthai man, shown by the inner dotted line, to the heavy, black line which represents the La Chapelle man. The difference would be even more strikingly shown in a plan view of the skulls.

Now, I do not think there can be any doubt but that the Java ape-man is in the direct ancestral line of the Neanderthal man. The main features of the skulls are precisely the same. If this is so, then between the brain of the Java ape-man and the La Chapelle man we have a progressive range of capacity of from 900 to 1,695 cubic centimeters, representing an advance which probably extends over 800,000 years. This i regard as the most important evidence we possess of the essential truth of the Darwinian theory as applied to the evolution of man. But we may also approach our problem from another and totally different point of

view. It is well known to all scientific mess who have given much attention to this subject, that the lower jaw is the most important single bone in the humain skaleton, as indicating many piace in the evolutionary scale. If, for illustration, we take Frot, Kestily drawing of the Heldelberg mandille, one of the seat acclant sized Foundation human jawed ever discovered, impresented by the black cottine in the drawing; and piace a modern European jaw ever et; shown in the drawing in flat sinch, we see the meaning and ignariousness of human evolution in this garticular hostine et a gisson. If we seek conspare the Biedelberg jaw with that of the gartilla as shown in Nig. 6, we see evisit in religious

A DAME OF BRIDE

pitte are, both with rafe

is charged that the Haddelberg faw is, in some re-sis, issuries: and stronger than that of the portion, mannin, the secondary part, is wider and the doub he jaw, from the tests to the lower border, is greatat the Hudel of the jew, from the seeds to the lower border, is greated than in the portlin. But it has beeth are purch abundant, which are purch abundant, and the portlin. But it has beeth are purch abundant, and the provincing to form a chim as in modern man, alonge backward as in the aps, and the inside of the front part of the jaw, that part which lies immediately because the of the jaw, that part which lies immediately because the provincing to the provincing the provincing and the provincing to the provincing the provinc gradual, harmonious and evenly balanced modification of all the parts of an organism.

Man threw off some of his authropoid features much

ore rapidly than others. It also tells us that the orely human arrangement and form of the teeth were purely aquain arrangement and form of the teem were faily evolved at the very beginning of the Pleistocene ara. Here again we see that if Penck is right in his estimates of time, we must go back more than 1,600,000 years to find the purely authropoid ancestor of man, if evolution has taken place according to the Darwin-

if evolution has taken place according to the Darwin-ian theory.

We come now to the consideration of a paghistoric skull which is probably destined to be the object of more scientific discussion than any previous discovery in this field. I rafter to the so-called Pilitown skull found by Charles Dawson, F.S.A., F.G.R., and Dr. A. Smith Woodward, F.E.R., as Pilitown, Stussey, England.

Smith Woodward, F.M.C., at Pitthown, Summer, Engiand. This discovery, the five published "report of which appears in the Journal of the Geological Society of London for March, 1913, consists of the larger part of the skull bones and the right half of the lower Jaw.

The "find" was made in a flint-bearing gravel which has yielded some of the most aucient forms of stone implements and the teeth of sub-tropical species of als, including those the hippopotamus, an early Pliocone elephant, the mastodon and others. There can be no doubt that these remains represent a being who lived during late Photene or early Pleisto-cene times. The lower jaw ore primitive in features than the Heidel berg mandible. The pecul-iar features and relation-

ship of these two astonishing human relics are shown in Fig. 8, taken from the Journal of the Geological Soclety above mentioned. The ascending rames of the Piltdown jaw is somewhat smaller than this feature in the Heidelberg jaw, but the slope of the front part is much greater and in this respect more ape-like.

Fig. 7.—Profile drawing of the Heldelberg mandible (in malli-

contrasted with the lower jaw of

org man

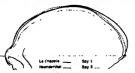


Fig. 10.—Outline tracings of various human skulls of the Paisolithic Age. (From Boule.)



Fig. 11.—The Galley Hill sons. Redown in type, Just retigated to be 200,000 years old.

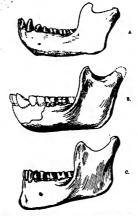


Fig. 6.—Bestoration of the Piltdown mandible (B), compared with that of man (C) and the young chimpansee (A), in left side of view.

But for the two molar teeth found in the jaw it would adoubtedly pass as the remains of a primitive anthro-id creature. But the teeth, although presenting indi-dual peculiarities which distinguish them from those yidual peculiarities which distinguish tuem irom in the Heidelberg jaw, are purely human and the variations are not greater than are found in human teeth

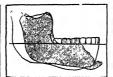


Fig. 8,-Mandibular ran superposed on seidelbergensis, that

of to-day. In Dr. Woodward's restoration of the Piltor to-oney. In 1r. woodwards restoration or the Pilli-down skull be has given a distinctly anthropold char-acter to the front teeth. In my own restoration or this mandible, which was presented before the Inter-national Medical Congress, held in London last August, this mandible, which was presented octore the ameri-national Medical Congress, held in London last August, I have represented the front teeth as of a coarse human type. I will quote my reason for this from the re-marks I made before the Congress:

"Let us consider a little the probabilities and the few facts we have concerning this dentition. It resemblee the Heidelberg mandible more than any other human jaw yet discovered, but although exhibiting much more refluement in structure than the Heidelberg jaw, it is more primitive in certain respects than that specimen. The backward slope of the front of the jaw is evidently greater than in the Heidelberg man-dible and the similar character of the lingual part of unite and the amulan character or the lingual part of the front of the jaw is even more marked. But is the variation in these two jaws greater or as great as we sometimes find in modern jaws? I do not think so, and while it may be legitimately attributed to a so, and while it may be legitimately attributed to a somewhat entiler date than that of the Heidelberg special fact, I suppose no one would suggest that it should be placed farther back than late Pilicone times. The critical question that we have to ask, then, is this: 'Is there any, reasonable probability that the human ancestor of late Pilicone times would have so anthropold a jaw as is shown in this restoration by Dr. Woodward? This teeth in the Heidelberg jaw are essentially modern in every respect and smillier, notwithstanding the concusions size of the jaw, than the teeth of some primitive races of to-day, 'don what grounds may we assume that it little farther back: we should find so similar a destition as we have been? This form in Dr. Woodward's restoration is esparated from the Heidelberg mandible untold spass. It the Heidelberg jaw is late Pilicene, the Pilideova mandible would have to be Miccone, and I confess that I de not know that we should be warranted in assuming that the human ancestor of Miccone times had a law so much like that of the modern ape swhat earlier date than that of the Heldelberg speci

It is, I believe, assumed that the common ancestor of man and the anthropold spes had a generalized form of dentition which probably resembled the present almuma form as much as the present nothropold form. We have some indications of that generalized form in Dryopithecus, Pllopithecus, and Mesopithecus. from that generalized form the human and the simian trom that generalized form more and more specialized in forms have each grown more and more specialized in accordance with the original variation—if the separa-tion of the two branches occurred in Miocene times and the specialization in different directions continued until the late Pilocene period, is there any probability that we should find this anthropold dentition after that ensely long period of progression toward the modern human?

We have, I think, a logical right to assume, in the absence of any evidence to the contrary, that the denti-tion of early or late Pilocene man resembled the human dentition of to-day as closely as the dentition of the early or late Pilocene ape resembles that of the ape of to-day. If I am right in that assumption then it is clear that the dentition of the restored l'litdown skull is unwarranted."

Since the date of that meeting Dr Woodward has found a fossil canine tooth in the gravel beds near the spot where the other portions of the skull were discovered. He claims that this tooth, which is distinctly anthropold in character, belongs to the l'llidown jaw, and that it, therefore, establishes the correctness of his restoration. Now all the other bones of this skull are of a rich brown color caused by the iron in the gravel beds, but this new discovery is of a dead black color, totally different from all the others. If this tooth was originally in the Piltdown mandible, as Dr. Woodward claims, I can think of no reason for such a strange ciaims, I can taink of no ressou for such a strange phenopenon as the marked difference in coloration, and, so far as I am aware, there is no known precedent for it. My own criticism of Dr. Woodward's restoration of the Pittdown skull was confined to the dentition, but Prof. Keith has made a very vigorous and trenchant ault on the entire restoration.

Dr. Woodward gives the skull capacity of the Plit-

down man as 1,070 cubic centimeters. Prof. Ketth continueters, or a ilttle more, thus bringing it about up to the average of modern man. The point is of vital importance in its bearing on the problem of human evolution. It seems evident at a glance that the Piltdown skull is not In the line of descent of the Neanderthal race. The supra-orbital ridges are but slightly develop the forebond is fairly full and well developed. The upper part of the head is



Fig. 9 .- Profile of the Heidelberg mandible (outline) contrasted with that of the mandible of a

therefore, according to Prof. Kelth, in the line of descent of modern man. This brings us face to face with an astounding situation. We have in the Piltdown skull the remains of a being estimated to be half a million years old, with the skull and upper part of the head closely resembling modern man, but with the lower jaw of a gorilla. We cannot escape from the fact that (Concluded on page 444.)



Fig. 12 .- The man of La Chapelle-aux-Saints. A entative of the Neanderthal race.

# Wireless for Railroad Trains

# A New System Which Secures Uninterrupted Communication at All Times

THE utility of the wireless telegraph in directing the movements of ships at sea, in communication and from ships, and in calling for help in emergencies ins been strikingly demonstrated, but it remained for an enterprising American railroad to apply wireless communication to and from moving trains. A test just made successfully on the Lackawanna Railroad on a regular express train running between New York city and Buffalo, though only a partial test in the experi-ments thus fur conducted, has shown immense possibilities of safety and time saving by insuring that trains will siways be in communication at any speed and at any distance from stations, regardless of "line breaks" from winter blizzards or from washouts, fog which obscures signals, and other extraordinary condi-

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In the ordinary wireless telegraph system m are sent and received between stations equipped with nutcume or "aerials" supported on high towers. The Lackawanna Railroad has stations of this kind at Scranton, Pa., and Binghampton, N. Y., with a working radius of about 300 miles. But, of course, it is out of the question to place any structure such as an ordinary aerial on a rullroad train which has to pass through tunnels and under bridges, and a prominent feature of these tests is the use of a highly special serial for the train installation. Some very recent experiments, notably those conducted on November 21st and 23rd, have demonstrated that wireless ration can be maintained to and from a train equipped

with a very low aerial, viz., a quadrangic of wire supported at a height of only eighteen inches alove the roof of the car. The distance between Scranton and Hinghampton is about 65 miles, and in the experiments just made it was found possible to main-tain communication from a train running at 55 miles per hour, part of the time direct from the train to the fixed station away from which the train was speed ing; and when the train had proceeded to a point too far away for its short uerial to force signals through to this first statler direct, the signuls were de ifvered to the station by being picked up at the sec ond station and relayed back. At no time during the tests was the train out of communication with both stations in this way.

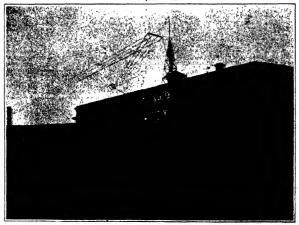
The arrangement used consists of four quadrangu lar aerials mounted on the of four adjoining cars of the train, and only 18 inches above same, as stated Each quadrangle is connected to its neighbors on the other cars by a speclai attaching ping wireless operator's station is installed in a booth in the third car of the group, so us to bring the lead fron his apparatus to the four-fold nerial at a point at the middle of same. The regular Marcoul system is employed, except that the power is furnished by a special motor-generator set driven from the regular train-lighting dynamo, and the ground connection is made to the rails by a wire to one of the cur trocks The aerial is of heavy cop per wire, and is insulated for the high sending volt nge (between 8,000 and 0,000 volts) by large porce-lain insulators mounted on iron posts at the corners of the car.



The wireless telegraph installation



Two of the cars of the wireless telegraph equipped train, showing the aerial above the car reofs and the wireless operator's cabin.



The 700-foot aerial of 300 miles working radius on the roof of the Lackswama Railroad station at

The special neefalness of the system was indicas the other day when the conductor of the train we taken ill, while his train was running at high spe-westbound. The next station at which a relief or ductor could be obtained was Scranton, 30 miles away. Ordinarily a delay would have been unavoidable—either a stop in order to send a telegram by wire asking for a stop in order to send a telegram by wire assing too a relief conductor or a walt at Squanton after arrival at that point. But thanks to the wireless telegraph equipment there was no need to take either of these measures. Instead, the conductor notified the wireless operator on the train and the latter sent a direct to Scranton, with the result that a relief con ctor was on hand to take charge when the train pulled in. In the same way an extra car, nee pulled in. In the same way an extra car, needed to provide accommodations for an unusual crowd of pas-sengers, was ordered to be in readiness to be coupled on at Scranton, thus eliminating the delay that would ordinarily have been experienced in getting the car up

Apart from this emergency value, however stration that the wireless telegraph can be depended upon for unfailing communication between running trains and fixed stations and between the trains them-selves may mean a revolution in the operation of trains comparable to that which followed the introduction of the ordinary wire telegraph for this purpose. railroads can install reliably tuned equipment whereby dispatchers and train conductors are able to keep in direct touch regardless of stops, it becomes possible

to save no inconsiderable amount of time in routine train operation-possibly stances to the time saved by regradings, cut-offs, and other improvements on the right-of-way that require auch large appropriation of central

Aerology in the Arctic THE results of the sounding-balloon observations made by the Franco-Swedish expedition at Kirupa (68 north latitude), in Swed-ish Lapland, during 1907. 1908, and 1909, have fust been published by M. H. Maurice, chief assistant at the observatory of Trappes. Not the least remarkable fact in connection with these observations is that of 72 balloons sent up, 41 were recovered, with their meteorographs. The country about Kiruna is sparse ly settled, and the inhabitants are rather primitive. Before the observations were begun, circulars in four languages—Swedish, Finnish, and two Lapp dis-lects—were widely distributed, announcing the naureu, announcing the na-ture and purpose of the un-dertaking and requesting the finders of balloons and apparatus to return the same intact to headquar ters, in consideration of a vard of 15 crowns (about \$4). Similar notices were nched to the balloons marives. Most of the balloons were returned after a considerable lapse eral years. One be into a lake, where it was recovered after three years. The bishest sittinde rec ed was 22,760 meters (over 14 miles). The height of the stratosphere was found the stratosphere was found to vary as in temperate latitudes; i. e., it is higher in emmure than in winter, and higher over stratey, closes than over

1.75 20

# The Panama-Pacific International Exposition of 1915 Description of the Exposition Site, the Main Courts and the Great Exhibit Palaces Hamilton M. Wright

THE site of the Panama-Pactic International Exposition lies within the limits of San Francisco, as a crescent upon the shores of San Francisco Bay, and just inside its "Golden Gate" entrance to the Pactic

No more picturesque location could be imagined. On the south, east and west the grounds are eactreled by the contingual of varying counters, rising successively from 200 to 900 feet above see loved, this the enfolding walls of a vast suphithester. Upon the north the site opens out upon the harbor of the Pround the shores of the continuation of

easered whole strates of the tooleen cute, guarantee seeks side by rugged cliffs and protected by forts.

The central portion of the site lies slightly above the sea and is encircled on three sides by gently sloping ground; within a short distance from the boundaries of the site these slopes change to steep hillides, and thus the site becomes the floor of a large amphithenter, from whose sides the exposition will be seen stretched out below. To the cest and south the residence section emired to the steep of the steep side of the steep sides of the steep side military nearwards, and to the west and southwest the site is cashraced by the wooded slopes of the Presides military nearwards, cafer with cypress and enculpries and interspersed with consaional vistas of green valleys.

and encalprious and istorrepersed with occasional vistas of green valley.

The exposition buildings were planned in great grouppage to conform to their impressive natural entroundtings on the shores of San Francisco Bay. With the material control of the shores of San Francisco Bay. With the state of the shores of San Francisco Bay. With the principation to blend with and fit into, it was felt by a sufficiently at combination to which was confided the pressit work, that only the broadest and boddest charge of conference on the shore of the state of the short of the sh The buildings are easily accessible from the courts, a fact of inestimable advantage to exposition sightseers who sometimes grow weary of the long distances to be

The expesition palaces, built upon an east and west axis, will face the bay upon the north: they will parallel the stream of the great incoming traffic of the world through the western gate of the United States. Ships setting in harbor pass before the expesition grounds where the great buildings are fast arising. The harbor itself will be a part of the great theater upon which will be staged the world's jubilee, and 4he Golden Gate will be the entrance to the theater.

A mirvelous panorams will be afforded victors on ships coming through the Golden Gate. As one books from the harbor he will see three main groups of exposition buildings. There will be the great central group comprising the fourteen exposition palaeses to devoted to general exhibits; there will be the group upon the left hand or east end devoted to ammement concessions and covering sixty-five across. The right hand group upon the Presidion military reservation and nearest the Golden Gate will be devoted to the pavillons of the States and participating nations

From afar, the central group, the main exhibit pataces, facing for more than a mile upon San Franciscoharbor, will present the offect of aimest a solid massing
of palatial structures, a great walled city, a city of the
Orient, with outside walls, as high as the average sixstory city block and with golden domes and towers
rising to heights of 200, 300 and 400 feet. Nearer at
hand it will be seen that the exposition palaces are intempersed with great open courts. Three main couris
will run north and south through this central group.
In general the buildings of the central group are to be
brought into contact with those next adjoining by
areades, courts and archways. Through this method of
freatment four of the general exhibit palaces of the
main group, fronting horth upon San Francisco Bay,
but set back a distance from the water's edge, will
present a single abrillectural design. Their walls and
the adjoining arches will form the main northern facado
of the exposition alway the shorts of the harbor, the
marveless frontage that will be first seen by visitors
who reach the exposition city by water and enter San
Francisco Bay through the Gelden Gate. By day the
gittering piltars and minarets of this mile-long facule
will be seen as a dream city, while by night they will
reflect the sheen of a million lights into the bay.

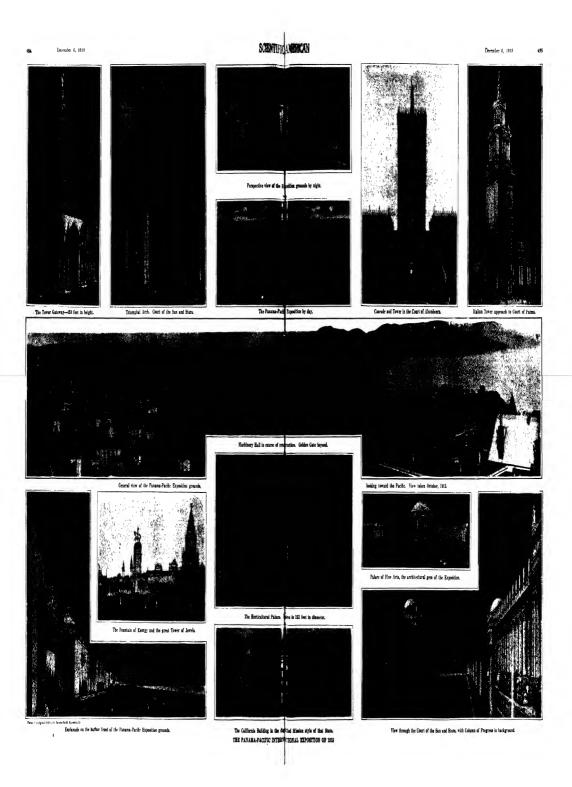
effect the sheen of a million fights into the bay. Hefore the façade and along the harbor's edge for more than a mile there will be built a great esphanade a vata stretch of ground and terraces in which four-time will play and groups of statuary he sed at intervals. Brilliant flowers and hardy flowering trees and strubs will slend warmin and color to the esphanade indeed, throughout the exposition, flowers and foliage will contrast with the shinking colonandes and peristyles and walls of the buildings, and will enhance the beauty of innumerable lagoous, fountsin and water effects. The esphanade is to be known as the "Marlna" (villa gardens)

The much groups of buildings will lie between a tropical garden or boulevard ramining cast and west alous the fringe of the billis nearest the city upon the south and the explanated along the shores or San Francisco Bay upon the north. The tropical boulevard, to be known as the "Alameda," will be eighteen hundred feet in length and three hundred feet wide; it will be glowing with fountints, lagoons, statuary, perhydres and areades, and, secluded from the winds of the bay, it will be transplanted with a production of semi-tropical trees, plants and flowers, including the orange, bannan, olive myrite, and every variety of pains. The cast end of the Alameda will open out with a please upon Van Ness Areauc, use of the principal boulevaries of San Francisco. The west end upon the Preddio will be surmounted by a commemorative arch of triumps.

The theme of the exposition, its sentjurre and mural paintings, will easil the spirit of achievement through which America has completed the Panama Canal. In the courts there will be observed monumental expressions in Greek and Roman, Oedidental and Orlental architecture. The grounds will become a vast troplet and sent tropical garden through the transplanting of palms, evergreens and flowers. A brillbart yet harmonious color scheme has been designed by Jules Guerla, one of the best-known authorities on decorative coloring in the world.

ing in the world
The prevailing color tone of the exposition will be an
ocher, a tawn; buff, several shades removed from white,
ye in the distance giving the effect of white; but it will
unt be glaving under the brilliant samight of 'culfornia,
in the courts there will be a marvious biending of
colors; Ponnelian red, strong Italian blues, vermillon
and orange will predominate. The court system is
unique in that it will permit each architect, artist or
sculptor to present some distinct canception, without
clashing with the exposition architecture and coloring

(Concluded on page 426



The main group of exhibit palaces, facing upon the

harbor for 4,500 feet, will present practically the ef-fect of a single palace. Eight of the buildings will be joined in a rectangle to form what will amount to a

huge Oriental bassar-a veritable walled city, with its

The walls of the eight exhibit palaces will be broken only by a number of stupendous entrance ways which will give access to the great interior courts and their

approaches. The group will be divided from north to

south; lu the center by the Court of the Sun and Stars. designed by Messrs. McKim, Mead & White of New York; on the east by the Court of Abundance, and on

the west by the Court of the Four Seasons. Two south courts will be cut like niches in the walled city, one

south of the Court of the Four Seasons and one south of the Court of Abundance. A huge court in Italian renaissance will lie between the rectangle and the Pal-

Of all the courts the great central court, the Court of the Sun and Stars, 750 feet in width from east to west

and 900 feet along its main axis, will be the largest an most imposing. At the south end of the court will b

the huge Tower of Jewels, rising 430 feet in height and dominating the architecture of the exposition. The

upper part of the tower will take the form of terraces leading up to a group of figures supporting a globe, typifying the world. The tower will be lined with jewels, which will glitter like diamonds when searchlights are turned upon them. At the base of the tower,

which will occupy an acre in extent, will be a huge arcade 125 feet high, beneath which the visitor may

enter into the Court of the Sun and Stars from the

in the vanited archways of the tower itself will be grouped a sories of mural paintings, designed by Jules

Guerlu, and expressing the keynute of the exposition

of the Court of the Sun and Stars will be found in a

superb classical colonnade extending entirely around the court and surmounted by figures symbolical of the stars

teen feet in height, and each will stand out in radiance through a crown of dazzling jewels of light
In the center of the court will be a great sunken gar

den, surrounded by benches to seat about 7,000 people

in the garden will be groupings of classical statuary dancing figures, fauns, satyrs and nymphs, flower-

trees and vines will contrast with the statuary and with

To the east, as one passes from the Court of the Sun and Stars to the great east court, or Court of Abundance,

will be a huge triumphal arch, the Arch of the Rising Sun, 160 feet in height and surmounted by a colossal grouping of statuary; camels, Oriental warriors and the

great central figure of an elephant will crown the sum mit of the great arch. To the west on the approach to the

Court of the Four Seasons will be a triumphal arch of like proportions, the Arch of the Setting Sun, sur-

mounted by a group representing western civilization A huge prairie schooner will comprise the central motij

As one passes beneath either of the vast triumphal

arches to the east court, or Court of Abundance, or to the west court, or Court of the Four Seasons, he will tra verse great avenues between the exhibit palaces who sides will be adorned with mural decorations and screened by classical colonnades. Pools of water

reflect pavements of gold Giant banks of flowers and

rener pavements or gott Gunt banks or nowers and potted pains will leud color and imagory to the vista. If the visitor passes to the east, or Court of Abundance, he will behold a vision surpassing the richest dreams of the Orient. The Court of Abundance is dedi-

cated to music, dancing and acting; it is designed for

imgenutry, and will constitute the proper setting for Oriental or modern drama upon a colossal scale.

Oriental phase of the Spanish-Moorish architecture. Ornamentation upon an elaborate scale will be helped by brilliant lighting effects. Electric scintillators will

play upon fountains at night, reflected colored lights will cast a spell throughout the court. The walls of the

closter will be decorated with mural mintings; exotic

flowers, trees and vines, orange trees in fruit and in

blosson, will contrast with the statuary and the huge From the Court of the Sun and Stars the visitor in passing to the west will come to the superb Court of the Four Seasons, of which Henry Bacon, designer of

the Lincoln Memorial, a monument to be built in Wastfington, D. C., in honor of Abraham Lincolu, is the architect. In its theme this court will typify the con-quest of nature by mankind. In each of the four corers of the court will be cut great niches into the en

circling exhibit pulners and in each of the niches will be large mural paintings suggesting the seasons, spring, summer, autumn and whiter; lofty colonnades will screen the niches. In the center of the court will be a

hitecture of this great court

den do

The

will partake of the

the superb colonnades and towering gold

e figures, of which there will be 110, will be four-

south garden

of the group.

s, towers, minarets and great interior cou domes, towers, minutes and great and of the eight buildings, as shown by the ground or block plan, will face out on San Francisco Bay and four of them will face the hills of the city on the south.

#### SCIENTIFIC AMERICAN

great grouping of statuary in which Cares, Goddess of Agriculture, will be shown dispensing the bounties of

spon a colessal scale. The Court of the Four Messessa, opening upon the harbor. Will be entered through a stupendous gateway, the Gate of Columbus. The visitor will pass through the gateway possant a tower to the scalesande upon San Francisco Bar. Directly before the tower will be seen a colossal figure of Columbus, facing the water. Ornamenting the tower in recesses. will be figures representing the great voyagers of the

Before the entrance to the great Court of the Sun and Stars upon the bay will be a lofty column, whose spiral will depict men's indomitable impulse toward achievement. At the summit of the column will be the sun. On the left and before the Court of Abundance will be the Gate of Balboa, before which will be placed a colossal statue of the discoverer of the Pacific

cisco Bay upon the north, and upon the great tropical garden upon the south. Vast beds of flowers in bloom will be set in the south garden; the plants will be re-

placed by others when their flowering seasons are past.

The exhibit buildings, constructed by the Panama-The exholt comming, constructed in the raisant-Pacific International Exposition Company and devoted to general exhibits exemplifying the advance of the world in the arts, sciences and industries, will be the loftlest exposition structures ever erected. On the east of the rectangle of eight buildings will be Machinery Hall, the largest single structure of the exposition, covering ten acres. In the south garden at the east end and near the concessions center will be located Festival liall, and near the west end of the Palace of Horticulture, a huge glass structure, covering five acres and sur-mounted with a dome 180 feet high—Finnking the rectangle on the west will be the Palace of Fine Arts, a angle on the west will be the Paince of Fine Arts, a classical and beautiful structure embedying the spirit of the Italian Renalssame. The Phiace of Fine Arts will be partly circular in form, with an extreme perimeter of 1,110 feet It will face upon a great pool in

which its outline will be reflected.

Of the three main groups, the one on the east will comprise the concessions or amusement center, which cupy sixty-five acres and will be the first of all parts of the exposition to be reached by those who come from the down-town portion of San Francisco. Its entrance will be by way of a plaza, at which the conce sions district will open out upon Van Ness Avenue Through the concessions area will run a broad be vard, the Street of Concessions, more than 3,000 feet long. The domes of the buildings will be illuminated at night and startling electrical effects will contribute to uight life of the exposition at the amusement center The western group will include the area occupied by

the various states. Each structure in time pace of an exposition grounds will present upon a magnified scale the effect of a superb residence district.

Still farther to the west of the area of the States and foreign district will be a great drill ground, capof accommodating at one time 10,000 troops in Foreign nations will send their crack cavalry and infantry to participate in the maneuvers and trials of skill. Encircling the drill grounds will be a race track, where international speed and harness races will be held. Prizes of \$175,000 are offered for live stock; \$225,000 for harness races; \$45,000 is offered by bre

structures will be the stock pavilions and the buildings devoted to live stock, poultry, domestic pets and other displays. The Government Life Saving Service display will also be located here.

Throughout the entire exposition the illumination will be such as to bring out the colors of the courts in their proper tones, to sharpen and intensify the color effects.

The illumination of the colonnades will be accomplished through purple lights, the windows of the exposition palaces will diffuse a golden ray. Giant batteries of colored searchlights will be anchored in the harbor be fore the site and will play against jets of steam and smoke that will be liberated high in the beavens. Searchlights 500 or 600 yards out in the water, and before the mufu axis of the exposition, will direct bat-terles of light over the exposition palaces, going through more than 300 evolutions in color.

The bureau of forestry of the Philippine Islands will send tropical timbers to the United States forest service so that their suitability for time furniture veneers may be ascertain.

The ornamentation upon the waterfront will also upon a colousal scale. The Court of the Four Seas ont will also he

Each of the three main north and south courts will open out upon the esplanade on the shores of San Fran-

the pavilious of the foreign nations, by the buildings of the States upon the Avenue of Commonwealths, and by the display of the United States Government The as of the foreign nations, farthest from the bay, will rise in terraces as they advance up the gradual slope of the Presidio military reservation. Nearer at hand and closer to the water will be the buildings of the various States. Each structure in this part of t

Marking the extreme western limit of the exposition

Dirigible and Am

I T is difficult to obtain at any given time a semples attacement of the strength of the various and one in aircraft. The most reliable authors is that famile for public information by the Office of Naval Intelligence public information by the consense of starts instrugence of our Navy, which is herewith presented. It will be seen that the United Sixtes ranks far below the leading mations in military aircraft. Our one small dirigible is regarded as "practically inseless."

STRENGTH OF THE LEADING NATIONS IN AIR CHAFT.

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One dirigible, which is practically useless, is on hand,

#### The Grashof Medal Presented to George Westinghouse

A T the annual meeting of the American Society of Amchanical Engineers, December 3rd, there was presented to Mr. George Westinghouse the Grashof Medal, which was founded by the Verein Deutscher ingenieure in memory of Franz Grashof, the famous engineer and professor and author of many imp works and the theory of elasticity, general mechanics and machine design

This medal is given by the Verein only on recommen ation of the Council and by maniform or recommendation of the Council and by maniform who have rendered pre-eminent service in the field of engineering either in research or in practical activity. It is the highest honor in the gift of the engineering profession

Among the men who have received this honor in the Among the men who have received this honor in the past may be mentioned the following: C. von Bach, professor of machine design and one of the founders of the modern theory of elasticity and a lender in the science of testing materials in Germany; Gruson and scleence of testing materials in Germany; Gruson and Schichan, founders of immense engineering plants— metallusgical and mediane construction—and shib-build-ing yards from which some of the best German ships, both commercial and war vessels, have since best sunched; Gustav Zesues, whose contributions form such an important part in modern thermo dynamics; Carl von Lindo, one of the formoders of the retrigerating Carl von Linde, one of the founders of the refrigerating infuntry, as well as one of the men who did most for the development of its theory and the understanding of the processes leading to the economic production of cold and liquefaction of air and other gauss; Prof. Riedler, well known in the field of steam engineering; Sulser-Steiner, in whose works many new types of Sulser-Steller, in whose works many new types of Dissel engines and steam turbines have been developed to commercial success; %. Slaby, known by his work in many branches of electrical engineering; Gustav de Laval, who was also made honorary member of the American Society of Mechanical Engineers, for his in-Lavar, was was no mines morrary memory of the American Society of Mechanical Engineers, for his invention of steam turbins and centrifugal apparatus of various kinds: Hermann Biolim, one of the or of the great Blohm and Yose shipbuilding yards, spitell of German marine engineering; Frot. Aurel Sodois, one of the greatest authorities living in regard to the theory of the steam turbins, hisself an inventor; Centil Pecidiand von Zeppella, one of the most popular and-picturescue for a form to the produced the Euppella simble, the pride of the Germanian autors; Frot. Martons, a nutversally recognised authority on testing materials, and therefor of the National German Inches for the Companion of the

The State of State of

Putters Prices of Commodition and Materials By Alex. Del Mar, Fermenty Chief of Bureau of Com-merce and Navigation, United States Treasury

DURING recent years, noticeably since the opening bot the present century, a remarkable rise of prices has occurred in the Western world; the Eastern hemi-phere not being at all affected by it. Nor has the en uniformly influenced; the rice being

Western world been uniformly influenced; to observable chieffy in the four leading early seems of the seems of the contrast of of the rise thus far.

On this subject opinions have rem ably varied. In an address to the bank-ers of Minnesota, Mr. William C. Brown, president of the New York Central, himanker, attributed the rise to th increased supply of gold and to "the failure to increase the products of our farms in anything like the ratio of increase in consumption." This he thought exerted thrice the influence attributable to gold Mr. W. B. Ingalis, in an elaborate essay published in the *Mining Journal* three years ago, and guided largely by the Saurbeck (British) and Bureau of Labor (American) Index Numbers, attributed the rise "to a variety of causes," such as gold production, exhaustion of natural resources, standard of living, monopolies, protective tariffs, demands of labor, and civic congestion. Because no substantial appreciation had occurred "in the Indices of all classes of commodities," but only in se no declining tendency was

observable in the rate of discount; and because "the observable in the rate of discount; and because "the ratio of increase in gold has been less than that of iron, copper, lead, tin, and sinc," he concluded that gold, "though not without effect," had not excreted any observable influence upon prices. The principal causes appeared to be the others mentioned show, to which he also added "the demand and supply" of commodities.

In the debates attending the passage of the Payne-ddrich bill of 1909, and the Underwood bill of the present year, one side attributed the rise mainly to the tariff. This the other denied. In Mr. Payne's g

speech of May 2nd, 1910, he even cistmed that his hill, though less than a year old, had lowered the price of mests, vegetables, and other commodities, especially those consumed by the poor. His list of tariff "reductions" included 138 specified commodities and classes of commodities. He attributed the rise of prices not so much to the increased supply of gold as to the "reduced cost of gold, owing to new methods of producing it."

With great esteem for the distinguished authors of these various researches, a careful review of the causes alleged does not appear to satisfactorily account for the rise, especially for that greater rise than elsewhere which has admittedly taken place in the United States. All of the alleged causes, except the tariff, have operated in the four principal States of Europe, and even as to tariff, this has been materially raised in all of them exbeen materially raised in an of them ex-cept England. Unless by speculation, gold cannot influence prices until it is coiped into the money in which prices are ex-pressed; and none of these researches dispresset; and note of trees researches on-cuss the mint statistics, or the wast ship-ments to India, where much of it is buried in the earth. No merchandles whose pas-sage through the custom house is made the subject of a tax, pays that tax. It is the importer, the man, who pays; she the relation of his import taxes to the the relation of his import taxes to the prices of commodities is much the same as that of his excise, or itemse, or in-come taxes. He shifts as much as he can upon other people, and they shift back. The eventual result is a general diffusion of taxation. Upon a final salelysis it all comes down to the cost of government and the benefits derived from government, both studies, and Municipal; far not intensity as subject to he hurs or cise. both wedgen! State, and Municipal; far too designies, a subject to be lung on the pastgrachitusline of a tariff bill. This may do fite "politicis," but not for politicis economy. Of the other alleged causes of the time, such ine suprimitival production and commencipation, relatest resources, standard of "bring, ofte commencial and the statest resources, standard of "bring," ofte comments, necessity of the comments of the statest resources, standard of

wages, rates of discount, demand and supply, it can only be said that they are either too slow, remote, or inadequate to satisfactorily solve the pending problem of prices in the United States. A reminder of national

ditions may lead to a more satisfactory expianation. The population of this country is about 100 millions, f whom nearly 40 millions are engaged in gainful occupations which yield on the average nearly a thousand dollars a year, or 40 billions, with an expenditure of

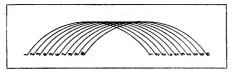


Fig. 1.—Diagram illustrating order of rise and fall of prices of various classes of commodition

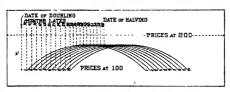


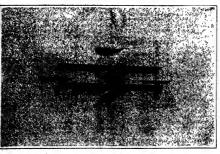
Fig. 2.—Diagram showing that a rise and fall of different prices may occur

35 billions, including about 10 per cent pald for Federal, State and Municipal Government. What has to be furnished is a cause og causes competent to explain a general rise of a third to a half in the cost of living and of probably a fourth in the prices of the commodi ties employed in the industrial arts. Such collossal sums as the above cannot be explained by any of the causes advanced; these are altogether too trifling. Something else, something hidden, unlooked for, unex-pected, must be discovered, to account for the immense rise of prices in recent years. Moreover, it must be a cause which has especially affected the United States. If under man's supervision and with no additional

(Concluded on more 116.)



Curtiss hydro-aeroplane fitted with a disk stabilizer.



In flight, without using the ailers

#### A Dished Disk Stabilizer

Some time ago there appeared he our column Aeronautica, Notes a brief description of a stabilizer had just been patented, and which consists of a disk slightly dished and mounted above the plane of an neroplane. Shortty after the Inventor of this upparatus brought in a small working model which demonstrates strated very conclusively that the apparatus would bring the aeroplane to a level position no matter in what direc-

tion it was dropped. Since then, the inventor, Mr. II. C. Flske, has had the stabillzer attached to a full-sized machine in order to prove its worth. Mr. Wiltiam 8 Luckey, of the Curtiss School, who, it with be remembered, carried off the first honors In making the circuit of Manhattau Island on Columbus Duy, fitted his machine with one of these stabilizers. It was a crude affair built hastily under Mr. Fiske's direction It consisted of a dtsk of canvas seven feet in diameter with the stdes ed upward ten inches from the horizontal at the extremities. The device weighed 11 pounds. The form of the stabilizer and the method of mounting it upon the hydro-seroplane are clearly shown in the accompanying photograph With this device Mr. Luckey made a number of trial flights, which he declared to be very satisfactory. He writes: "I find medium speed, the aeroplane very steady without use of the allerons. I also found it very effective at high speed in straight flights and medium large circles. It was not necessary in any of this work to use the alterons. The machine banked and landled very alcely in calm air and in a wind of thirty miles velocity."

One might contend that a stabilizer such as this would increase the head resistance of the machine, but it was found in actual practice that the speed was not affected materially, and if, as Mr. Luckey claims, the alterous could be dispensed with, the head resistance would be materially reduced. for the ailcrons undoubtedly act us brakes

The device is so should that it hardly needs any ex-The curve of the stabilizer is such that if tho machine starts to drop sidewise, the air banking up against the lower side of the disk will bring it back to level. When making a turn the machine banks automatically, for the interni drift due to centrifugui action brings air pressure against the side of the disk and causes the plane to lift on the outer end. Even with the crude stabilizer, the aeroplane showed a great deal of stability ugainst pitching. This could be mate-rially increased by dishing the stabilizing

disk as in the small model. Mr Luckey found that he could land or alighthe water at a much reduced speed.

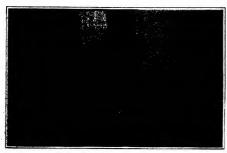
One of the accompanying illustrations, which shows the machine in flight, was which shows the machine in high, was taken after it had made a swoop from a considerable altitude in order to come down within the range of the camera. At the time it was traveling it a speed of about 70 miles per hour. Heretofore it has been necessary for the avintor to be constantly working with the allerons to keep his machine from being affected by sudden gusts of air. Apparently with the new stabilizer he need not bother with the controls and the operation of the machine is greatly simplified

#### Building the New Capital of India

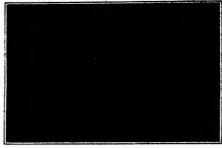
LTHOUGH nearly all the government offices in Calcutta have now been nbandoned, little progress has yet been made toward the construction of Indla's new wluter capital, which is to occupy a site of three or four square miles adjoining the present city of Delhi, and for a year or most government work is to be carried on at Simla the year round, though the viceroy and other important officials are spending the present winter at Delhi. About 25 miles of transway are being laid about the site of the new city. It is understood that the Imperial Delhi Commlitee estimates the cost of the new capital at about \$20,000,000, though the impresston prevails in India that the cost will be double this amount. About 6,000 men are now working on the site, and when the work is in full swing from 15,000 to 20,000 will be steadily employed. An incidental task will be the improvement of sanitary conditions in the old city

## Inventions New and Interesting

Simple Patent Law: Patent Office News: Notes on Trademarks



Lever machine for bending rails



Ascertaining the curvature by means of the bend gage.

A RAIL bending machine, in order to be thoroughly suitable, should exert a uniform bending moment of proper mag-nitude on every point of the rail. It should easily transportable, thus avoiding the peoms to be bont.

In most bending machines so far in use the rail is laid on two supports and a pres the rail is laid on two supports and a pressure exerced between these on the rail. The bending moment at the points of support thus is wil, rising uniformly toward the point of pressure, where it reaches its maximum value. It is therefore noncessary, in order to obtain a uniform bond, to shift the color of the pressure of the pressu the points of support and the point of pressure along the whole length of rail or (as in the case of bow bending machines) to apply the machine at brief intervals.

to apply the machine at brief intervals. In the new lover boulding machine de-signed by Richard Peukert, of Haida, Bohemia, the power acts on the rails on both sides, outside the points of support, and in such a way as to keep the moment between these points constant, so that the rail may be circularly bent over the whole rail may be circularly bent over the whole intermediary length. The action on the levers is exerted by a screw winoh. The leverage, as well as the pitch and arrange-ment of the screw, are so chosen that the loss of power is reduced to a minimum. The machine is operated by two men as

After the levers have been laid over the rail head at sufficient distance for the screw winch to be attached while the nuts are slackoned, the lever ends are pushed apart and the winch is drawn together by actuating the ratchet On next releasing the winch, the ratchet pawl is turned over, and the winch turned back, first by me of the ratchet and afterward with the sid of the hand wheels. The machine is ther suitably connected together by two chains and drawn forward to another working section, viz., the distance between the two lever centers. After the first operation, lever centers. After the first operation, the bend must be checked by putting on a

When using a Peukert bend gage, both the concave and convex curvature can be ascertained by determining the putch from a meter chord. The bend is then gaged most accurately by stopping the apparatus, while drawing together the ma-clime. When a certain experience has been gained, a bend, including the shifting forward of the machine, will be effected in ee minutes as a maximum.

In installing a railway a short time ago, all curved rails, (180 millimeters in height and 150 millimeters in width at the lower flange) were bent by means of the Peukert machine. The bending operations were carried out on the spot, the average daily

A Novel Rail Bending Machine
By Our Berlin Correspondent

being 190 meters of finished bent rails with
a radius ranging from 20 to 50 meters.

#### Soldiers' Universal Tool

THE accompanying illustration depicts a very interesting tool particularly adapted for the use of soldiers. It conadapted for the use of somers. It consists of but three parts with two interchangeable pins, yet it may be converted into over a score of different tools. The stock of the tool is provided with a handle stock of the tool is provided with a handle that is electrically insulated, so that the operator need have no fear of electrically charged wrees. The broad blade is pro-vided with a keen cutting edge, and may be attached in different positions to the stock, so as to serve as a hatchet, adx,

or spade, depending upon its plane with respect to the handle. One of the illus-trations shows the blade employed as a shield to protect a rifeman. Mounted as a hatchet, the tool may be safely used as a hatchet, the tool may be savely un-for breaking down wire obstructions. A pick attached to the stock may also serve as a handle for pliers, pipe wrench, wire cutters or wire twisters. With the broad as a handle for puers, pipe wrenon, we cutters or wire twisters. With the broad cutting blade removed from the head of the tool, we have a hammer as shown in one of the views. The stock is pro-vided at one side with a file, and is graduated along one edge so that it may be used as a foot rule. A projecting part may serve as a scrow driver and also as a can opener. The number of uses to a can opener. The number of uses to which the tool may be put is apparently



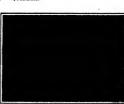
The head serves as a has



The hatchet as a shelter.



The tool as a snade



The tool makes a good wrench.



The stock is formed with a file surface.



Cutting a barbed wire enterelled

#### Incombustible Linoleum

THE manufacture of incombustible line leum, or, to speak more accurately, of linoleum that burns with difficulty has been a goal long aimed at by linoleum factories a goal long armed at by modelum isotories.

The attempts previously made have been based on the plan of adding incombustible matter, such as asbestos or ammonium salts, to the mass during the process of salts, to the mass during the process of fabrication. Far more promising is a new scheme, described in Technische Monste-latie, in which magnesium carbonate is added to the mass. All the carbonates have the property of giving off carbon dioxide when heated at high temperatures. This, as is well known, is a very heavy gas, which does not rise, but croeps along the floor. For this reason, in case of a fire it would stand to cut off the annuly of air it would stand to cut off the annuly of air it would tend to out off the supply of air from the imoleum. Magnesium carbonate is chosen because it breaks up at lower is chosen because it breaks up at lower temperatures than any other carbonate. The principle involved is, of course, one commonly used in the manufacture of chemical fire-extinguishers.

#### A Proposed Bureau of Labor Safety

agrees seeking to create a bureau of Labor Bafety in the Department of Labor with a special reference to investi-BILL has been introduced in Cor with a special reference to investigation as a special reference to investigation and devices. Such a bureau if instituted should give an impetus to the production and development of improvements in such devices for factory and railroad use, in fact wherever labor is employed. With and one million six hundred thousa road employees in the country, the demand for labor safety devices should be earmently developed and their introduction and maintenance strong entorous. No one is more interested in the provision of safety devices than the laborers in the particular industry to which the special devices relate and the demand sought to be created by legislation should receive attention from

#### Non-splintering Gla

VERY ingunious process for producing jahout when broken has been devised, ac-cording to Lie Nature by a Prench investor. One side of seek of two glasse plates is covered with a thin coating of galaxies, a thin clear plates of celluloid is juid between these two surfaces, and glasse and between these two surfaces, and glasse and these two surfaces, and glass and cells up then united by strong pressure integer page.

of fly, be

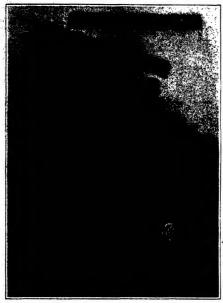
rom flying shards. .

age householder is seldon THE average householder is seldom a good inarginam and yet at any time he is fiable to have to cope with an intruder who is an expert with firestrate. Hence, it is quite essential that he be provided with seasons and the provided with seasons and the provided with seasons and the seasons has handless. The burgier usually has the advantage in knowing the general direction from which the man of the house will approach, whereas in looking for the intruder one never knows in what persistenter nook he may be liding. Revolvers provided with flash hamps have been invented which easile a man to light up a flark room suddenly and discover any intruder, but such a revolver places one at the mercy of the thick, while the light is wavering about the room in search of him. To take slam, the householder must bring his eye into alignment with the revolvers as that the hosten-holder must bring his eye into alignment with the revolvers are sensity been introduced, which makes it unsecossary for one to stand directly holitof the run. The one of the

mary for one to stand the gun. The cone of makes it unsecessary for one to stand directly behind the gun. The one of light thrown out from the searchlight conteins a black center which indicates the spot that will be hit by the builst, so that a man hiding behind a door or piece of furniture and peeping around to take size, may hold the gun far to one side, so se to mislead the burgiar as to his position. As long as the black spot is on the intruder the householder known that his revolver is properly trained. The accompanying illustration above a revolver with the improved searchlight and tabelment and also a sectional view makes it unner attachment and also a sectional view through the searchlight. It will be found to consist of a battery A, a mercury switch through the exachlight. It will be found to consist of a battery A, a mercury without B, lamp C, and leuses D and E. The lean D is perforated on se to form the dark spot above referred to. The mercury valve consists of a small giese vessel in the shape of horizontal S. Normally the drop of mercury within the vessel lies in the forward compartment. But on raising the grun sharply, it flows must the raising the gun sharply, it flows past the central constriction into the rear compertnert and closes the circuit between the lamp and the battery. When it is desired to disconnect the lamp permanently, a knurled thumb piece at the reasend of the flashlight is turned, breaking the connection between the casing of the flashlight and the rear terminal of the hattery.

#### A Gasoline Motor Plow By Frank C. Perkins

THE accompanying illustration shows a graciline motor plow designed and natruoted at Bedford, Va. The engine is



Searchlight that shows where the builet will strike.

of two cylinder type and develops nine half the time required by horses.

of two cylinder type and develops nine horse-power.

The plow is provided with a truck at-tachment and will haul 1,100 pounds up a 6 per cent grade. It steers with both front and rear wheels and with the reverse can turn as sharply as an automobile. This attachment adapts the machine for all operations from breaking the land, to the planting and cultivating of the crop and the hauling of it to market. The machine is equipped with two speeds, one for plow-ing and cultivating the other for road work and hauling, either of which can be varied greatly by the throttle at the will of the operator.

The plow pulls a two horse turning botton, outling eight inches deep and twelve inches wide. When cultivating, the cul-tivators are hooked up behind with a jointed lever, the small rear wheels out in one direction and the front tractor wheel one direction and the front tractor wheel in the opposite direction, and the machine is turned short, at the end of the row. When breaking land with a turning plow, to make the quarter turn at the corners the plow is roversed three or four (set, in which space it turns shorter and in about

half the time required by horse.

The motor of the plow can be thrown into and out of gear and the speed regulated without letting go of the handles. The two, large, spiked drive wheels pull the plow, large, spiked drive wheels pull the plow.

The plow holds the drive wheels to the The plow holds the drive wheels to the ground and the spikes prevent them from alipping, so that the machine works equally well in sod, soft ground, loam or sand. It is a practical machine in rough land. When the plow strikes a root, stump or tight rook, instead of straining or jerking as horses would do, the spiked wheels slide and the machine, but the spiked wheels all desired the machine, but the spike and the machine can be thrown out of gear instantly. It is then easily raised by the handles, as quickly thrown in gear again,

and passes over the obstruction.

Included in the attachments used with the plow are the turning points for breaking land, a seeder for planting corn, cotton or other seeds, dropping them in rows or hills, other seeds, dropping teem in rows or nils, cultivators, which include discharrow, weeders, listers and sweeps. A spraying attachment including tank and pump, may be mounted between the handles for may be mounted between the hardles for spraying trees, or crops in rows and potent spraying trees, or crops in

bar and rake attachment will prove useful in harvesting small crops of hay, clover,

#### A Three-Axle Water Ballast Motor Roller

ONE of the most outstanding features of the recent international Roads Congress Exhibition held in London, was Congress Exhibition held in London, was a new type of water ballast motor roller. The distinguishing feature of it is the introduction of a third axle and roller. It is the joint invention of Col. Crompton, the eminent British motor and road

con, the eminent British motor and road authority, and Mr Tapp.

The three-axle roller is designed ex-pressly to produce a level or regularly surved surface, as free as possible from the harmonic recurring waves or depressions which may occur to some extent with the ordinary two-axle roller.

essential feature of the invention comprises the three cylinders filled with water, carried on three axles and at-tached to a rigid frame. The general disposition of these rollers may be gathered from reference to the accompanying il-lustration. It will be seen that the frame lustration. It will be seen that the frame ends in a pluce at either extermity to which the outer rollers are attached, and both are steering cylinders, the rear cylinder moving relatively to the front cylinder. Only the center roller, which is the driver, is spring mounted.

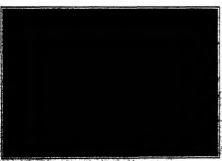
The motion of the driving central axle

in an upward direction is limited by stops which can be brought into action when and as required, the roller then being free to fall below, but not above an adjustable fixed point relative to the two end rollers. The adjustment of this point and varia-tion in the distribution of the weight tion in the distribution of the weight upon the three axies is effected by means of a special form of screw adjustment operated by the hand wheel on the frost fork head carrying the leading roller. The total weight of the roller, shown in the illustration, in light running order without water ballast, is 22,384 pounds.

With water ballast in the rollers and a full tank the total weight is increased up to a maximum of 27,600 pounds. But the to a maximum of 27,600 pounds. But the weight is distributed in such a way that at no time is the weight on the front roller less than 1,904 pounds in excess of that imposed upon the rear roller, this being necessary to prevent both front and rear steering rollers from leaving the ground.

The adjustable variation in roller pressure enables a single roller of this type to carry out the work of both light and heavy rollers of other types, and makes it eminently suitable for rolling asphaltic or tar-macadam surfacing materials, the minumum rolling pressures being utilized minimum rolling pressures being utilized during the early passages of the roller over the surface, while for final consolidation the rolling pressure can be increased up to any desired extent within the limits of the machin

The use of the stops, which prevent the





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harmonic waves in the rolled surface he-catus, in passing over the ridge of creek of a wave, increased pressure is brought to bear on the road surface at this point matically by the center roller, fo automatically by the scales roses, acrong the surfacing material down into the hollow or depression, over which, by virtue of the spring action, the roller then passes ased rolling pressure production of harmonic wavy st production of marinoms wavy surfaces is obviated still further by unequal spacing of the three axies, the distance between centers of the front and center axies being greater than the corresponding distant between centers of center and rear axle.

#### Notes for Inventors

Notes for Inventors 
Photographing the Band-master for the 
"Movies."—Fatent No. 1,069,221, to Jacob 
Beek, Munich, Germany, provides for 
synchronizing a moving picture and a 
musical accompaniment thereof by photographing on the film the performance of 
the actors and simultaneously photographing on the same film a refected front view 
of the band-master directing the musical 
accompaniment. The band-master shotograph is of disposed that it may be obscured 
from the front of the access and shown a the front of the screen and shown at the rear, so that the photographically reproduced leader may direct an orchestra or band located in the rear of the picture.

or band located in the rear of the picture.

A Two-part Buttle.—A divided bottle has been patented, No. 1,064,442, by John E Cadigan of New York city in which the bottle is composed of top and bottom parta, the top part having a neck and being open at the bottom and the bottom part being open at the top and a central part which forms the bottom of the top part and the top of the bottom part has ular grooves to receive the respective parts.

Paper Overshoes.-Morris H. Siegel of New York city, has secured patent No. 1,008,942, for a shoe whose sole, side, toe 1,008,942, for a shoe whose sole, size, toe and heel pieces are made in one piece from paper with each side piece folded about opposate the ankle to provide grow sections which may be folded to contract the open-ing in the shoe to hold it upon a shoe on which it is fitted, means being provided for fastening the gore sections when so folded.

A Reinferced Kinematographic Pilm. Charles Dupuis of Charanton, France, has secured a patent, No. 1,068,747, for a kinematographic film, It consists of a band of strong paper baving openings and photographs on gelatine in and openings so that the film is of uniform thickness throughout, the feeding perforations being cut upon the edges of the paper in prope relation to the images.

A New Base-ball Score Board.—In a patent, No. 1,069,920, George S. Coleman of Washington, D C., shows a score board provided with representations of a human figure arranged in succession. Light may pass through the figure. Attitudes may be assumed which correspond with those be assumed which correspond with those of a player while in the act of moving from one point to another. An illuminating device is passed in rear of the representations in succession to produce the effect of a person moving in the direction of the series.

Combined Can Opener and Pouring Spout.—In a patent, No. 1,069,388, Lewis Colwell of Chicago, Ill., shows a can-puneturing and pouring attachment in which an annular band in sections has one of the sections provided with spurs to or the sections provided with spurs to puncture the can, another section pro-vided with a pouring spout, with a outter adjacent to it to puncture the can forming an outlet to the spout and with levers connecting the sections so that they can be drawn together to secure an opening of the can.

of the can.

Living on an Expired Patent.—A Washington with when recently asked what a friend, who ched out a presentious living, was deciag, replied that be thought he was "living on an expired patent." He will denty thought this was funny, and did not realize how many people made very good livings indeed out of expired shares the large where the another them and the write recalls inpasses where the inventor made more money out of the invention after the petents superior than the control of the patents.

The control of the patents with the inventor after the petents superior than the inventor after the petents superior than the inventor after the petents superior than the control of the patents.

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The notices are inserted by special arrangement with the inventors. Turns on application to the Advertising Department of the Science For American.

Pertaining to Appeared.

SOLE BRIDGE.—5. D. Marsawer, 90 John St. New York, N. Y. The primary object here is to so improve arth supports or bettigns of hoster and shoots as to make them obtaped in construction and more efficient to two than devices herelefore proposed for this purpose. The main portion is made of word, and hence the charge, light and region and possessed of sufficient strength to resist beauting of discrete strength to resist beauting or discortion.

HOBIEST.—D. O'DONALIS, 550 W, 371st St., New York, N Y. The object here is to provide improvements in knit socks, stockings and like knit articles whereby such articles can be assily worn and held up in proper position without the use of separate devices such as garters, bees supporters, and the like.

Of General Interest,

VERTICAL PILE FOLDING.—M. B. Jack
nos, P. O. Drawer 788, Victoria, B. C., Canscia. Among the objects here is to provide a
filing device which will reduce the tendency to
mindle papers, means being provided as to
necessitate the opening of the file in order to
introduce additional papers, but which locking
means is of such a simple nature as to require but a moment's time.

quire but a moment's time.

STILL.--II. B. PHILLIPS, Pairmount, N. C.
The invention pertains to improvements in stillin more especially those used for the production of turpeculae. It provides a device in which pine wood containing turpeatine may be treated without any danger of overheating the wood. The device is of a portable nature and may be readily set up in one section and moved to another.

ARTIFICIAL BUTTERPLY.—P. SERLINE, New Kenslagton, Pa. The purpose of the lavest-or is to provide a construction in which a but-terfy may be caused to take substantially any pose and be revelly second in place whanever desired. Another object is to form artificial butterfiles of various colored cloth or other material, so as to match with different am-

ronndings.

POST ANCHOR.—F. T. Ballar, Newport.

R 1 The intention here is to provide an enboring base for posts which may be readily placed in position on posts, the parts being so formed as to require a minimum amount of work in essembling and properly positioning the posts and anchors in the ground.

the posts and anchors in the ground.
BRUSH - A. L. Riotzwaw, 1824 Chestmi
St. Pbiladeiphia. Pa. The Invention provides
a brush arranged to permit the user to con-veniently and quickly replace a worn out bright holder by a new one and to silow thorough cleaning of the holder and the support thereof with a view to keep the breash at all times it

DIOR LOCK—F. Watern Westernville, N. Y. This invention relates to improvement in door locks in which the door is made to one and close simply hy a slight push or pail ou lie handle, and can be attached to or re-moved from the door more simply and more easily than the common lock.

Heating and Lighting.

RESTREY WATER IN SATER.—R. C. BOYER, 1985 Pepper Ave., Lincoln, Nob. The exacutal object here is evolved in the provision of a heater which include in part an agrangment of circulating coils of play on an arrangment of the country of the control of the country of the control of the country of the country

manenanes and mechanism Sevices.

RELL.—J. Porcours and L. Rozziko,
care of improvided Mrg. Co., 32 Union Square,
Now York. N. Y. This larestion relates to improvements in bella, and has for an object to provide an improved structure of single, strong construction with a disfumm number of parts and positive movement of the articles members upon the actuation of the operating hostory.

botton. PLUMB BOB.—J. Gambians. Twonfy, N. J. An object of the inventor is to provide a bob, the body of which is adapted to bouse the cord by which the bob is -uspended while is use. Another is to improve the construction whereby the drum on which the cord is wound whan bound within the dwive may be supplying which is to withdraw the cord, to return the cord into the bob, or to lock it at all options the cord into the bob. or to lock it at all options the cord into the bob. or to lock it at all options in the cord into the bob. or to lock it at all options in the cord of the cord in the

Into the both, or to look at any owness owners.

DIFFER FOR STRAM SUOVELS AND

DERDOMS—C. BUTLES, 1570 Broadway, Nove

creaturing or design mentioners and has just

finance on the strain design of the strain design of the strain design.

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The strain of the strain design of the strain design.

DRILL BUT UPFERS.— In Sec. 1961.
DRILL BUT UPFERS.—In Sec. 1961.
DRILL BUT UPFERS.—In Sec. 1961.
Drill I be this special the input processor. to work work, machine, for it is not a processor. It is the special to the input processor. In the input processor is not a processor in the input processor. In the input processor is not included in the input processor in the input processor. In the input processor is not included in the input processor in the input processor. In the input processor is not included in the input processor in the input processor. In the input processor is not included in the input processor in the input processor

MECHANISE FOR ROTATING AND LOCAL ING THE CELEPRISES OF NEWOLVERS.—CURRENCES OF NEWOLVERS.—CURRENCES OF NEWOLVERS.—Currents of the stripe mechanism controlled where the stripe mechanism controlled with the controlled of the stripe of a review whereby the cylinder is rotated internative of its step-vise movements, no that analyty remarkers or accidental fischarge of 8 weapon is learned.

weapon is insured.

MOLD FOR MAKING CONCRETTS WALLS,

—B. A. ISLER, 566 BEASOOK, Br. BROOHER,

N. N. Y. This ferrestion certains particularly
to a machine or mold for use in the forming
of concrete force, watin, partition and the
walls of the mold are raised successively as the
walls of the mold are raised successively as the
wall is builty up in Eddenses, and may or may
not be supported by the lower portion of the
wall already result.

Pertaining to Betreat

Pertaining to Becreation.

RATE CLAMP.—T. Rearc., 146 Greenwald

St., Bine Island, Ill. The object been in to so
construct the clamping mechanism of a roller
shate as to produce an article combining the
chements of strength, despuses, reliability and
case of manipulation, having reference particularity to the bracing consection between the
champing screw and the means for supporting
the front wheel saids.

Portsinter to Validas

Percassance to Vabioles.

WHEEL WITH MULTIPLE AND BALANCED SIME—H. LOTTE. 4 Rec Pascel
BOUNCY, 81. Sent d'Angli, Charents-Indefrours, Prance. The invention relates to improvements in the wheel with multiple and balance rims making the subject-matter of the
United States pasced applicates find December, 1907. The wheel comprises a main rim
and auxiliary rims connected to the preceding
one pair in connected to the preceding
one pair to capacity of being displaced vertically and horizontally relatively to the main
rim.

ATPOMATIC JACK—J. T. Dixcox. 11 Red.

rim.

AUTOMATIC JACK — J. T. Dillow, il Reed
St., Port Chester, N. Y. The sobject in view
in this lawrition is to provide an improved
construction and arrangement adapted to be
secured to the axies of an automobile or other
vehicle for acting in a plumitty of capacities,
as for instance a jack, an emergency wheel,
and a turn habs.

DEMOUNTABLE RIM.—W. F. JERKINS, 900 E. Clay Rt., Richmond, 'Va. This device is of simple construction. but will positively hold the demountable rim in place when the latter is secured to the fixed rim. The lawsition provides a demountable rim which is split at one portion thereof, with means adjacent to the split portion for drawing the latter tightly together and firmly holding, it is place.

ughtly together and firmly holding it is place.

CARDUBETED:—W. Excit. 107 Shockers
Rt. Winchester, Ky. In the carbareter parantdo by this leventor a vaive chains and cylindrical vaive are provided being both formed
with annular series of air inlosts and annular
series of fuel inlets, and admission to those
inlets is controlled by the movements of the
vaive bongitudinally, as governor being providest action of the control of the control of the
opposite direction. The air and real admitted
the inletting presents on the vation is the
opposite direction. The air and real admitted
the inletting presents on the section in the
value of the vaive, pass to a mixing
chamber and those to the cylinder.

CHARMET AND LEASE OF the Cylinder.

\*\*YBHICLE\*\* DOTP SUPPORT.—Billiot\*\* C.

BAITE and D. RONYER, care of the former, 729

Congress fit, B. Detroit, Mich. The aim of

tops of buggies, automobiles, etc., which do

not necessitate the use of botts or piss, but

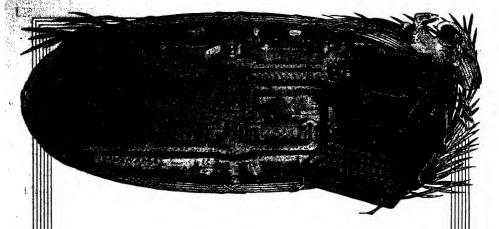
which are provided with sockets arranged to

receive huss so that the bows arranged and

and shifted without the necessity of with
draw bolts or cotter pins.

Nova.—Copies of any of these patents will be furnished by the SCHENFIFIC AMERICAN for ten cents each. Please state the name of the payentse, ittle of the invention, and date of this paper.

We wish to call strenutes to the fact that was in a position to be factored the was in a position to be factored the was in a position to readermost any control of the strength of the subject and presents all pasted applications, irrespective of the subject market introduced for the subject market introduced for the subject market introduced to the subject market introduced to the subject may be subject to the subject to the subject may be subject



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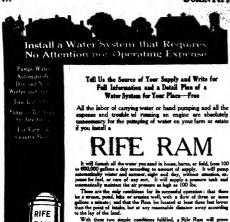
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The Origin and Brointies of Mea

this introduces new problems line our study of human evolution. It shows that evolutionary changes are not correlated in the human organism. That, of course, had been known before; but no such strik-ing and radical illustration of the fact

ing and radical Hustration of the fact has ever previously been discovered. It undoubtedly suggests that costain changes may occur comparatively weldenly according to the mutation theory of DeVrisa. This, and the fact that such highly developed skulls as that of the dailter Hill man mentioned at the opening of this paper existed 290,000 years ago, force ms to conclude that there have been according to the contract of the contr andden changes somewhere in the course of man's evolution, or that his origin as man must be placed back into an abyse of time that it is appailing to contemplate.

#### The Enlargement of Sculpture

(Concluded from page 436.)
point and so adjusted that no matter her the arms move these two points slways remain in the same straight line with the fixed point. These two movements—of the shaft and of the arms—make it possible for the extremities of the arms to touch any points whatever even in a compli group and its enlargement.

When the small plaster model has been put in place and the armature for the enlarged figure constructed and the core built out to within about two measure or its finished size, points are marked on the small model, many or few, according to the amount of detail. When the finger of the shorter arm is placed on one of th marked points, the finger of the other arm will indicate the corresponding point in the enlarged figure. A long, stender nail the enlarged figure. A long, stender neal is then driven into the eularged figure so that the head exactly touches the point of this honger arm. The number of point-that must be taken depends upon the amount of detail. But if the enlargement is of a head, for example, many points must be taken about the face when there is a great amount of detail. The sculptor fills in with clay, plasteline, or plaster, being guided in finishing the surface by the heads of the slender nalls Having thus the general form of the figure he can finish details of the surface as he desires. Both the plaster model and the armature of the culargement are m to revolve on parallel, vertical axes, and the mountings are geared top chain and sprocket, as shown in the draw in a range of the pointers.

The inventor of this enlarging device is the sculptor, Mr. Robert Paine, whose art education was received in Chicago and New York. He is now engaged in supervising the enlargement of sculpture at the Panama-Pacific Exposition

it was while Mr. Paine was an assist-ant of Augustus St. Gaudens that he beand of Augustus NI Gaudens that be be-gain to work on the problem of ealera-ment. The old method was very slow, consequently expensive; it was difficult to find men who could use it successfully; even in the most skillful hands the process did not produce an enhargement in the exact proportions of the original figure. It was suprovinate at hest. Sculptors had suffered much because of poor enlargements. One large figure was actually abandoned by St. Gaudens. The layman does not realize how many

chances there are for the sculptor's work chances there are for the sculptors work to, he spotled after the clay model leaves his hands. The plaster molder may after it—then the enlargement may be misus-cessful and again the plaster molder has cessful and again the passter molec new his turn and finally the stone curver. It is very different from the old time when one man alone saw the work through from start to finish—from the conception of the start to missim—from the conception. Of the incident of the conjulered marrie. The 'no-tion' of the statue is so important and so difficult to reproduce by the old mixth and that if for no other purpose these indicates up the armsture the pointing constitute is being being the constitute of the constitution of the constituti

invaluable.

He has old method about fifty points
could be set by one nice in a day with
the pointing mechine one thepsand may
be placed. Moreover, if the two men tone

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Friction, which is constrainty a pulling process (one can feel, who then a particular to the process of the pulling process (one can feel) who then around a rapidly receiving which pulls the surface, particles from their hold. This is "west," I cannot never particles that are resulting a piece of chall, when you write son a blackboard. You can take the process is the same, but she process is the same. Friction, which is as

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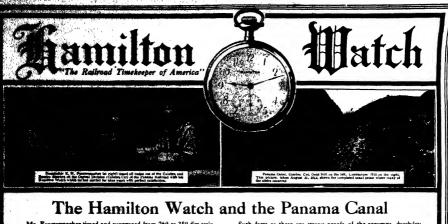


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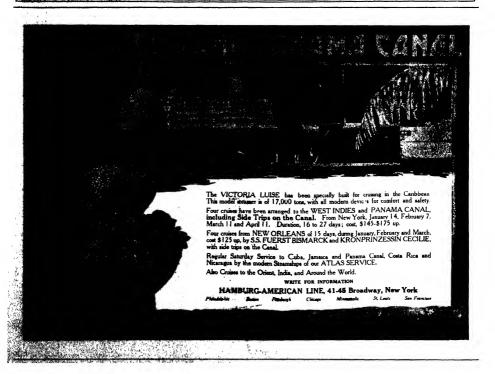
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attending each arm of the machine) are attending each arm of the machine) are careful, the points cannot be wrong so long as the machine is in perfect adjustment. It was this unerring accuracy with which the long arm gives the correct point

when the short arm touches a marked point of the model, that caused a Chicago workman ignorant of geometry to ex-claim, "Have you seen that pointing machine? It is like the Finger of God!

#### Future Prices of Commodities and Materiala

uded from page 437.)

personal effort, the yearly agricultural, mineral, and manufacturing output could mineral, and manufacturing output could be doubled, it would raise the rate of in-terest; seeing that by investing in pro-duction, the capitalist could sarn twice as much as by lending under present cir-cumstances. Similarly, if a means were invented which would cashle two pay-ments of money to be made with the same capital and in the same time in which only one payment can now be made, the effect on prices expressed in money would be the same as though the whole sum of money in circulation were doubled. It would infallibly operate on prices as did would infantily operate on prices as that the issues of green-backs half a century ago, or as we feared the full-tender silver dollars would operate in 1872, when we restricted their mintage and (for a time) limited their tender.

It is believed that the cause has been found not that it has doubled, or is go ing to double prices; but that it has sericountry; and is likely to affect them still further in future. The cause is the telegraph and telephone lines, which, owing to their enormous and exceptional incre in the country, have multiplied the meaus in the country, have multiplied the means of communication between distant per-sons in business, enabled a single dollar of money or of credits reduced to the velocity of money, to do as much work in making payments as formerly one and a third, or one and a half, dollars could do: thus rendering dollars superabundant and begging for exchange or investment at necessarily enhanced prices for commodities. For be it observed that not only have commodities risen: so also has the rate of interest for permanent loans of

If we divide commodities into ten marketubility, it will be found that they do not rise simultaneously, but one after another, somewhat as follows: 1, shares another, somewhat as follows: 1, snares in industrial enterprises, with international market; 2, shares, with local market; 4, staples, cotton, wool, tobacco, etc.; 5, merchandise, contractors' materials, ste. t 6, fabrics, machinery, etc.; 7, real estate; 8, skilled labor; 9, unskilled labor; 10, professional services. When the cause of the succeeded by opposite influences, for ex-ample, a shortage of the current gold supplies, such as that which occurred in 1825 45, the fall of prices would take place in the same order. Fig. 1 shows both rise and fall.

If (for the sake of further illustra-tion) the increased velocity of money had the effect to double prices in 60 months (5 years) and was followed by circumstances tending to restore them to their former level, then it would be seen that while some prices were falling, due to the assumed gold shortage, others, from the influence of the previous "velocity," would still be rising. This curious movement is shown in Fig. 2. Though the in Tooke's "History of Prices." This phenomenon, the velocity

This phenomenon, the velocity of money, was observed by John Looke, Henry Thornton, John Stuart Mill, and numerous other political economists of the past two centuries, though owing to the imperfec-tion of data, none of them essayed to comtion of data, none of them essayed to compute it even approximately. In 1894 it was computed for the United States by the writer at about two transfers of the dollar per west fer bombined money and credits, after the latter had been reduced to the velocity of money. It is now probably one transfer in three days; money much more active, while credits, as a



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## **CROWDS**

OF BUSINESS THE UNCLE TOM'S CABIN

By Gerald Stanley Lee

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The stage coach and post office began it; the railroads continued it; the general introduction of steam increased it; the bank check, the clearing house, the tele-graph and telephone lines have enormously augmented it; and the auto and flying machine may still further enhance it. In the western world money to no longer pieces of gold or silver to be weighed in the balance. Like learns, it has taken wings: it is now a mechanism which oper-ates with the speed of lightning, electrify-ing and vivifying everything it touches Such is the evident cause of the rise. Nor has it yet expended its force

#### Oilcloth and Linoleum Industry

S TATISTICS of the olicloth and line eum industry in the United States for Don are presented in detail in a bulletin soon to be issued by Director Harris of the Bureau of the Census, Department of Commerce. It was prepared under the direction of W. M. Steuart, chief statistics for manufactures. tician for manufactures.

This industry embraces establishments ugaged primarily in the manufacture of floor coverings of olicioth and lineleum (including cork carpet) and of enameled oficioth, including table, shelf, and uphoi-steress; olicioth, etc. Some of the estab-lishments in the industry also manufacture buckram and burlap wall coverings.

#### Value of Products.

The value of products of establishments in the United States engaged in manufacturing official and linoleum in 1800 was \$23,339,022, two thirds of which (\$15,550, 101) represented the cost of materials The value added by manufacture (value of products less cost of materials) was therefore, \$7,788,921. The olicioth and linoleum branch of the industry contriblinoleum branch-or the industry contrib-uted 67.8 per cent of the total value of products reported for the industry as a whole and 72.7 per cent of the value added by manufacture. Of the total number of wage earners, 81.2 per cent were reported by the floor oil-cloth and linoleum branch.

by the floor cil-cloth and linoleum branch.
The manufacture of ollcloth in the
Linited States commenced about 1807.
Statistics for the industry first appeared
in the census reports for 1810, when one
establishment in Philadelphia was reported as engaged in "Sonr cloth stamping." Its product was grien as 1,500

ing." Its product was gardy yards, valued at \$5,000.

The industry has shown continuous and substantial increases for the entire period since 1869 with the single exception of the decade 1879-1889, when slight dees appeared in several of the principal items shown. The value of products for 1900 was more than five times that in 1860, and the number of wage earners in-1869, and the number of wage earners in-creased 286.5 per cent between those years. The value of products and cost of mate-rials more than doubled during the decade 1869-1809. The percentage of increase in each case being slightly less than during the preceding decade. The number of wage earners increased 61 per cent and the amount paid in wages 73.5 per coffrom 1899 to 1900.

In 1899 the imports of elicioth and lin deum amounted to only 416,658 square gram amounted to only a10,000 square pards, valued at \$218,210, but increased steadily from year to year until 1807, when 7,109,067 square yards, valued at \$2,318,772, were reported. From 1907 to

89,313,772, were reported. From 1007 to 150 the imports decreased to 4.445,615 square yards, valued at \$1,234,560. The value of the exports of oll-oloths has also increased with each successive year, with the single exception that there was a decrease in 1000 as compared with 1008, and was hore than four times as great in 1500 as in 1508.

A Number of Strike Shoe Patenta.— Ciffics. D. Pesisi of Chicago, III., has client out a series of eight patents unit-bested from 1,500,714 to 1,005,721, tis-chastes, for beine shoes. The inventions children particularly to shoes having out-sides from particular and double mental seems, previous constructions being illus-

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and Queries.

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(12956) C. M. B. asks: Will you please bell ms in your question column he w long are was the first successful talking machine made? Also how long any was the first successful mixed to the property of the successful machine should be phonograph in 1876-77. It could hardly be called a successful machine, since its reproduction was very infidistact and faulty. It was the foundation for the wonderful results which have also been statained. The talking moving pictures were brought out in New York.

(12869) M. G. sales: Kindly let me know what you think was the same of the Dayton floods last apring. Do you think the sale sale of the Dayton floods last apring. Do you think that variety and the continued of the County of th (12869) M. G. asks: Kindly let me

(12870) H. B. T. asks: Will you plea (12870) H. B. T. saks: Will you please detries what summitum is, what it is made from or of, and what the process is? In electricity seed in the matting, and if so how? A. Altiminium is not a simple seed in the matting of the seed in the matting of the seed in the seed is per outs of the sarch is composed, and then from of which nearly \$6 per out of the sarch is composed. Over sween-eights of the outler maserials of the earth are then four elements. All day contains a large proportion of alternatium. All clay contains a large proportion of alternatium, and the contains a large proportion of alternatium, and the contains a large proportion of alternative and a large proportion of alternative and cryotine. These minerals are reduced in an electric furnace and the alternative large proportion of the contains a large proportion of the contains and contains a large proportion of the contains a large proporti

alumination is separated from the other substances by the intense head of the furnace.

(12871) J. H. K. asks: Will you kindly inform now behead to be furnace.

(12871) J. H. K. asks: Will you kindly inform now behead to be a substantial to the service of the s

Nos. 703, 703, 1077, 1184, price sen cents such, 1(2972) H. E. Z. acket. I wish to sale, 15 is its towns to what depth water sinks into the centh, for instance, undernoush swenaps and ponds. A. We do not know to what depth water sinks into the sents. Ourthally not deeper than to the point where the earth is at the temperature mass the surface, such as the neighborhood of horizontage and volumes. But the water does not sink far down in swenaps and benealty noted; they have water-light holdons. The swenaps and sink area. Unantly there is a layer of clear in such places, which holds the water.

such pisces, which holds the vaser. (1927a) T. A. C. aslet: A glass tube one foot long is closed as one end. dilied with moreover as in Provincille superinaries, but instead of resting on the bostom of the vessel, is it against period from one our of a halance. Does it has been period from one our of a halance. Does it has not see that it makes tay difference whether the tax not see that it makes tay difference whether the form the balance, and the means weights with the own the nearly seculated to the best of the control of 



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# SETT-NINTH YEAR MEETING

#### THE WEEKLY JOURNAL OF PRACTICAL INFORMATION

YOUNG SIX. ]

NEW YORK, DECEMBER 13, 1913.

PRICE 10 CENTS



Mallet-type locomotive fitted with mechanical stoker; built for experimental purp

## Stoking the Locomotive by Machine

#### A Large American-built Mallet-type Locomotive for South Africa

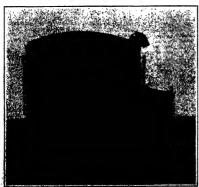
THERE has recently been introduced on the Union I of South African railways a large 2-6-6-2 Mailet type locomocities, built from the designs of Mr. D. A. Heedris, the chief mechanical engineer of the South African railways, to serve experimental purposes. The engine works on the compound system, and has no superheater, while the driving coupled wheels of the high and low pressure engines are of different sizes (3 feet 10 inches and 4 feet 3 inches diameter, respec-(a reet a) increes and a reet a) increes cambeer, respec-tively), in order to increase the hauling cajacity on the heavy gradients. The engine has a total heating surface of 33,385 square feet with a grate area of 49.5 square feet and a tractive force at 50 per cent cut-off. square feet and a tractive force at 50 per cent cut-off, of 45,000 points. The wheel-base of the engine is 41 feet 6 inches, and the total wheel-base of engine and tender 66 feet 9 inches, while the total length is 74 feet 10% inches and the beight from rail level to chimney stack is 12 feet 10% inches. In working order the engine weights 105 tons 2 hundredweight and the tender 60 tons 17 hundredweight.

The most interesting feature in this Mailet type of

locomotive is its equipment with the "Street" mechanilocomotive is its equipment with the "Street" mechanical stoker, the satient features of which are shown in the pictures at the bottom of the page. The tender is of the ordinary type, carried upon two 4-wheel trucks, It has a carrying capacity of 4,000 gallons of water and 10 tons of coal. The tender is first with a crusher of the moving jaw type, worked by an engine placed behind the brake pillar. The fireman showless the coal into the hopper of the crusher, which reduces it to a uniform size. The coal fails from the crusher, through a chute, into a receiver fitted behind the drawbar of the icomotive, wheen it is picked up by byteket workthe locomotive, whence it is picked up by buckets worknie accomotive, weenee it is picked up by buckets working on a beit in the pipe and is discharged into the central hopper on the firebox above the firebole door,
The buckets rise full on the left-hand side, and are
worked by another small engine placed on the top of
the firebox on the left-hand side.

There are three delivery pipes from the central hopper to the inside of the firebox. The delivery of the coal is controlled by three steam cocks operated by adjustable cams on the main shaft of the auxiliary engine, and can be directed, by means of a conical tray, either to the middle or to the right or left coal-feeding pipe, whence the fuel is blown into the firebox by the steam jets, the force of which is regulated by the to deposit the coal just where it is required

While it is premature to discuss the merits or otherwise of this stoker, it is claimed to have given better results, so far as locomotives are concerned, than any that have yet come under notice—it is undoubtedly a compileated machine, the fireman having to attend to two auxiliary engines in addition to handling the same amount of coal. Of course the labor of shoveling from amount of cost. Of course the labor of shaveling from the tender into the firebox is avoided, but every outne-of coal burned has to be transferred by hand to the crusher. A very noticeable feature of this delve is the noise. First there is the crusher working at a rapid rate, next the circulation of the conveyor belt, and finally the Maxim gualitie reports of the steam cocks. controlling the feeding, which all tend to contribute to produce a racket that is deafening to one who is unaccustomed to the working of the machine.



Forward and of tender showing the coal crusher.

the state of the s



Founded 1848

NEW YORK, SATURDAY, DECEMBER 13, 1913

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The Editor is always said to receive for examination illustrated articles on subsects of limity interest. If the photographs are source, the articles short and the fact entitlestic, the contributions will receive special alienilion. Accepted articles will be paid for at require scace rates

The purpose of this fournal is to record accurately, simply, and interestingly, the world's progress in scientific knowledge and industrial achievement.

#### Scientific American in the Schools and Universities

F the material which comes daily to the Editor's desk, not the ieast interesting and valuable is the correspondence of what might be called a the subject matter that appears in our columns. Of an editor realizes how difficult it is to keep in clo touch with the needs and tastes of his readers; and cer tainly none knows better than he how great is his desire at all times to gather just the kind of information which is desired, and present it in a manner which shall b at once illuminating and agreeable. The aim and scope of the Scientific American is stated exactly in the opening italicized words of our editorial columns: "The of this journal is to record accurately, simply and interestingly, the world's progress in scientific knowledge and industrial achievement."

Occasionally our readers are moved to write and tell

us how far, in their judgment, we are succeeding in our task as thus set forth; and always these comments are valcome, and always the suggestious which have practical value are noted and, as far as may be, follo

We have been much gratified at the widespread interest which has been awakened by our recent contest relative to the Ten Greatest Inventions of the past quarter of a century. We have received many letters from widely scattered localities and from people in diversified walks of life. Thus the professor of English at one of our universities writes us: "The Freshman English in the Nebool of Mining and Engineering of this university has been in my charge for some time At present I have nearly one hundred students enrolled In looking about for an interesting sub ject to begin the year's course, I noticed the contest you have been conducting in regard to the ten most important intentible devices. I asked the class to write papers on this subject and to select the one device which might be considered the most important. It may interest you to know that I received more papers or the subject of the wireless telegraph than on any other invention.

showing that the SCIENTIFIC AMERICAN straying very far outside of the lines which it has laid down for itself, we quote again from the same correspondent: "I have required the students to select some technical magazine for reading during the year, to enable them to keep in touch with the present state of progress in the field in which they intend to carry on their life work. Out of the one hundred students curolled in the Freshman English class, forty-three express their preference for the SCIENTIFIC AMERICAN.
We shall have monthly reports of the leading articles in your paper, followed by some class discustile majorial thus presented."

Apropos of the above we publish the following ex-tract from a letter received from the vice-principal of a high school in California: "May I express a word of appreciation for the great help which I constantly get from the Scientific American in my work as a scienteacher? My inhoratory is equipped with a baloptic with which we can project opaque material. I find your journal the best available source for good illustrations on live topics in all branches of high school science Nearly all of the pictures can be readily projected as they stand, but, where details need to be brought out or the cut is too dark, it is an easy matter to retouch them. Why would it not be a paying proposition for you to feature such work for schools? An increasingly large number of schools are equipping for opaque pro-jection work, and 1 am sure that the large army of teachers and students of science among your readers will gladly welcome anything which will make their work easier and more efficient."

Another correspondent writes us: "I have read with Another correspondent writes as a hard area much interest the matter in your current issue relative to the ten greatest inventions, and it seems to the writer that the result of your efforts is worthy of a more account of the contract of

normanent presentation from an educational standpoint, than the series of essays will attain; the tender you this suggestion." Our correspond Our correspondent goes on to propose that plates suitable for framing should be prepared, both of the inventors and of their principal inventions, and that these should be used to decorate the walls of classrooms in our public and high schools, taking the place of the less appropriate illustrations with which these walls are covered, and in some cases distinured

Now, although it does not come within the proof such a journal as ours to do work of the kind sug-gested, our correspondent has raised a question which we commend to the school boards throughout the country. In an age so thoroughly scientific and technical as this, the average mural decorations in our public and high schools are sadly lacking in that apparents and deep interest which modern facilities it so easy to provide.

#### Twenty-five-knot Battleships

The have been requested by a correspondent to give some description of the latest type , of British battleship of 25 knots speed. e respects these are the most remarkable fighting nodern times; for they combine with the speed of the cruiser a battery of guns of exceptional size and of the cruiser a battery of guas of exceptional size and power. The programme of the British navy for the year 1012-1013 called for five battleships of what is known as the "Queen Elizaketh" class. Not much has been published about these ships, nor is it generally understood what remarkable vessels they will be. It is our opinion that they will not be repeated in later classes; and indeed it is stated that aiready the British Admiralty have decided to return to a ship of smaller displacement and more moderate speed in their programme of construction for the next year. The "Queen Elizabeth," according to information published in British technical journals, is 640 feet in length over all, which brings the ship, at least so far as her length is concerned, into the cruiser class. Her displacement is io be 28,000 tons. The ship is to be equipped with Parsons turbines capable of developing about 50,000 horser, and this, in view of the great length and fine model of the ship, is expected to give her a speed under ordinary conditions of 25 knots, which, as everyone will recognize, is something altogether unprecedented in a bettiechle.

The armament also marks a great departure from existing practice. She is to carry eight 15-inch guus mount-ed in four two-gun turrets, ail placed, according to the American system, on the longitudinal center line of the ship. The 15-inch piece is a most powerful wear it weighs 90 tons and fires a projectile weighing 1.950 pounds. How great an advance this is will be under-stood by comparing its dimensions with that of the 12,5 inch gun, mounted on the latest ships of the British navy, which fires a projectile of 1,400 pounds. weight of the 15-inch gun is 96 tons, as against a weight of 76 tons for the 13.5-inch gun. The muzzle velocity is not high, being only 2,500 feet per second, but the energy is over 84,000 foot-ton

The armor protection will be just under 14 inches The armor protection will be just under 14 inches for the water-line belt and somewhat heavier on the turrets, slightly exceeding in this respect our own Newada" and 'Wichinburs', which hitherto have been the most heavily protected ships in any may. The "Queen Elizabeth" and her four sister ship will carry a secondary battery of skreen, tifty-esliber 6-inch guns, and side will sain mount guas for protection against a shade will sain mount guas for protection against airship attack from above. We are not surprised to learn that this class of ship will not be reprised to learn that this class of suip will not be re-peated in the British navy. The large amount of weight which must be allotted to the motive power, in order to secure 25 knots, might better be given to the armor protection or gams. This would be in line with the policy which we have steadily; and as we believe very wisely, followed in our own navy, where the speed is moderate and the armor and armament very powerful.

#### Universal Time Keeping

HE achievement of regular wireless or tion between the station on the Eiffel tower in Paris and the navai radio tower at Arlington Virginia, transmitting time signals between the two sta tions, marks an important stage in the progress of accurate determinations of longitude. For a number of weeks experiments were conducted in the transmission of these signals before satisfactory results were attained, but after interfe able, it was found prale, it was found practicable to make ats between the clocks of the Paris a d the Paris and the War ton observatories for serton observatories for several mannes. This result was reached on Novamber 20th, 1918, a date which may well be compared with September 18th, 1764, when John Harrison demonstrated the successful operation of his chronometer.

or his caronomores.

The joint work of the French and American commissions for the determination of longitude will now go forward with increased efficiency, and a higher dependency of precision in the determination of many positions. may be expected, to say nothing of the possibilities for the development of greater accuracy in navigation.

ANY LIVE CHEVENOPHERS OF GREET ACCUPACY IN INVIGATION.
It was long understood that differences in longitude, being proportional to differences in time, needed only precise and accurate timepieces for the solution of this most practical problem. Newtron usped the necessity for the development of a reliable chrosometer, but it was not until Harrison produced his instrument that a definite commercial device was offered. It is generally understood that the principal improvement in timepieces introduced by Harrison was that of the compensating balance, enabling temperature errors to be reduced to a minimum, but it is believed that another point was a minimum, but it is believed that another point was developed by Jim which is of much wider importance than appears in its use with the chrocosseter. Ordi-narily it was assumed that the great thing to be at-tained was a timepiece which should have a very sansil arror, or in other words, a watch which should beep vary good time. The navigator, carrying such a watch would always have with hint the time of a definite position, such as Greenwich Observatory, and by determintion, such as Greenwich Conservatory, and by determin-ing his local time by observations upon the sun or stars he could thus find the difference in longitude between his own position and that of Greenwich, allowing fifteen degrees for every hour, or one degree for every four minutes of time difference.

Harrison knew, what every instrument maker now realizes, that it is impracticable to make an instru-ment which shall be without error, but he also appreciated the most important fact that while he could not make an erroriess instrument, he might make one of which he could make an exact determination of the error, which was just as good. He thus set himself about to make a watch, not to keep absolutely correct time, but to have a uniform rate of error. A chronometer which loses precisely two seconds a day is as good as one which does not lose at all, since the correction of two seconds for every day enables the correct reading to be made for every day of the voyage. Since Harrison's time the chronometer has been much improved, but the reduction in the time of voyages has also made the necessity for long time corrections less necessary. Since modern vessels carry several chronomers, any serious deviation from the uniform rate is readily detected, and the unreliable instrument elim-

The most interesting example of longitude determina The most interesting example of longitude determina-tion by the use of the chronometer is associated with another scientific development which was far from be-ing appreciated until long rewrs afterward. When the "Besgle" isft England, in December, 1831, her com-mander, Captain, afterward Admiral Pitracy, was the prominent scientist on board, and the principal equipment of the ship was supposed to be the twenty-seven chronometers, carefully rated; the voyage being under-taken principally to determine the longitude of numerous islands and other points in the south Atlantic and

The important work thus accomplished has been somewhat overshadowed by the fact that the young naturalist of the expedition, Charles Darwin, whose work was cally an afterthought, employed his opportunities so well that the appearance of the Origin of Species, twenty-five years later, is usually coupled with the idea of the voyage of the "Besgie."

of the voyage of the "Bengle."
With the development of the electric telegraph the
determination of differences in longitude of places between which wire could be run, became a simple operation, show the volotity of time communication, became
so great as to superfind the less accurate method of
carrying timeptees bodily between the various points;
and repetition and reversal of signaling enabled arrors to be eliminated from this method.

As soon as the Atlantic cable was put into success al operation its applicability for the determination of time differences between points in Europe and America became evident, and so the work has gone on, until now the methods of radio-telegraphy are being drawn

into service. While the difference in longitude between Paris and Weshington is already sufficiently well known for all practical purposes, the existhinament of a regular wire-less time service, covering the wide areas served by the Paris and the Artington stations will enable numerous stations in the West Indies, in Central America, and is South America, to be equally well served, said these, in term, will herve their various tentroless.

#### bed in side

A CONTRACTOR OF THE CONTRACTOR

Semispheres Regulate Street Traffer. Experimental touth have been made this fall in Chicago of a semaphore signal for the control of steet traffe at the crossings. The semaphore is troadly similar to those used in railroad service. It is operated by the pollowman on duty at the crossing and it can be seen fully a blook away. There should be a future for this device, especially at the intersection of the busiest main thoroughteres of

Government Protects Naval Secreta.—The United States Government has brought suit against the E. W. Bliss Company, which owns the patent for the Bliss-Leavitst torpedo in France, Japan and England. The company whisse to give the details of its system to Whitehead & Co. of England. The United States Government, instaing that it owns a proprietary interest in the torpedo, is seeking to prevent this disclosure.

Engineering Reducing Corrosion in Pipes.—It is observed that the gases which water holds in solution have a marked effect upon the wear of from and steel tubes, and if the coyrgen is eliminated, the internal corrosion of piping is lessened to as much as one tenth part in certain cases. Following this method the hot water piping used for central heating systems can be protocated and will last much longer. At the top of the hot water pipes is mounted an air separator of suitable design which serves to remove the dissolved air. This is found to be very efficient.

Substituting a Steel Rallread Bridge in Two Minutes.

A steel bridge was recently removed and Shplaced by another, new Yotor, N. Y., on the Lahigh Valley Rall-road, in the remarkably short space of under five minutes; and this was done without any delay in the traffic. The new bridge which was put in place complete, even to its ballasted tracks, is a plate-grider structure, with a span of 108 feet. The main griders are 10 feet high, and it has a solid concrete floor. This mass was rolled into place in three minutes and was ready for immediate use. The old bridge was rolled out of the way in a minute and three quarters.

Feed Water Heating.—The new Brooke high, velocity feed water heaters are claimed to deliver water 20 degrees hotter than the usual heaters, and gain a considerable saving of fuel. When working with exhaust steam it is known that heaters find a difficulty in delivering water hotter than 170 to 180 deg. Fahr, when working at maximum capacity. With the new system this can go as high as 200 deg. Fahr. Such heaters are made in vertical and horizontal types and work equally well on live and exhaust steam, a very economical arrangement being to have an exhaust and a live steam heater working in conjuncting

Steam Meter.—It is a well-known fact that a large amount of steam is wested in many plants, and as this waste occurs in ways which cannot easily be detected, it would be of value to have an efficient steam meter. This is also useful for plants which deliver steam for different purposes in a works, in order to resion the cost in each department. The new Curnon steam meter is now proving to be quite a benefit to steam users. It operates by means of a small plug inserted in the steam piping which carries bent tubes placed in the path of the steam, these being connected by small plug place for the recorder. The recorder itself can be placed at any reasonable distance from the steam piping.

reasonable distance from the steam piping.

To Recerd Aeropiane Vibrations.—The vibrations which are produced by machines can be recorded upon a drum by well-known devices; but when it comes to recording the vibrations of an seroplase framework which is in movement in the sir and thus has no fixed point of support, the matter is much more difficult. A recent apparatus made by the Due de Guiche consists of a small air chamber covered by a disphragmenthich is weighted by a heavy disk. The inertia of the metal disk server instead of a fixed point, so that the air chamber transmits the different air pressures due to vibrations, by a firstible tube, to a second disphragment chamber, provided with a metal point which makes a record on a drum. We expect to describe this device.

A That Theorems Revent Stundard Type Academics.

record on a furum. We expect to describe this device.

A Text Townsand Seves Examined Ten Anxiliary Sailing Ship,—Another of those large and handsome sailing ships, which remaind us that the days of sail power are not altogether passed, has been launched power are not altogether passed, has been launched to the sail the sail the sail the sail sail the sail the sail the sail the sail appear of To,000 square beet. Her length is 450 feet, heam 55 feet 9 inches, depth 28 feet 3 linches, loaded draught; 26 feet, and when loaded her displacement is 10,700 tons. The ship has the large carrying capacity of 5,500 tons. Under sail spread is sirrog wheal, this thip is depicted as from a fitted and the sail that the sa

BATTANK CONTRACTOR

#### Electricit

Gieves for X-ray Werk.—The proteoting gloves which are generally in use for X-ray work are ordinary gloves having aspited on the back a layer of lead-containing ruther, as lead is known to stop the rays. But this layer is somewhat stiff and lacks suppleases, and besides it is only the back of the hand that is protected and the palm and sides which are often exposed to the rays have no such shield from their action. A Freach inventor makes use of a fabric which is much more facible and it protects the whole of the hand from injury by the rays. The new fabric is worse from slik which is heavily "sized" with a lead composition, so that it contains three times its weight of lead. This tissue has the advantage of being much more classic than that which has been used up to the present, and sate as a very good screen for the X-rays, especially when the back portion is reinforced. It will no doubt render good service to operators, who always run the risk of severe burns.

Electrical Protection of Ships' Halls.—That the corrosion of the exterior of ships' hulls is very largely due to electrolytic action is presty extensively recognized. The joined plates, immersed in sea water, form so many battery cells owing to the obnemical dissimilarity of the plates, and in each such cell the positive plate becomes pited. It is well known that boilers, condensers and the like may be protected against electrolysis tending to destroy them by attaching plates of sine in their interiors, since by the electro-negative relation of the interiors, since by the electro-negative relation of the non of the boller or endenser to the sine the latter is corroade and the iron rendered immune from corroston. The new method of protection of the hull is to make the latter electro-negative to a specially disposed from anote set in the hull in contact with the sea water. The special anode or anodes, insulated from the hull, are connected to an electric generacy the to ther pole of which is grounded on the hull. In this way the destructive action of the sea water is directed to the anotes alone; and the merit of the idea lies in the fact that those anodes are easily and cheaply renowed when necessary.

Generator of Record Size.—While we are familiar with large alternators for use with stars untrinse of 25,000 horse-power, and there are several projects on foot for machines of as high as 40,000 horse-power, the size of continuous current generators has not followed the recent progress in designing large machines. This is due to difficulties of construction inherent in this class of dynamo, especially as regards commutation. A machine recently built in France is of 4,400-kilowart capacity, which appears to be the record for size. It was built at the extensive works of the Société Alascienas Belfort and will soon be running at the central plant of the Longwy Steel Works. The machine is a generator on the 3-wire system with 489 votte maximum, and furnishes a current of 9,170 amperes, working at a standard of 94 revolutions per minute. Of the usual multipolar type, the field has 24 poles and also a set of commutation poles. Exterior diameter of this giant machine is about 18 feet and the total weight 86 tons. The ortsating set weight 38 tons. The present generator is to be coupled direct upon a gas engine. A second machine of the same kind in one wider construction.

machine or the same kind is now under construction. Diesel Engine for Electric Generators.—The use of different kinds of prime movers for driving electric generators has also led to special designs of dynamic landers of the property of th

#### Science

Col. W. C. Gorgas, U. S. A., famous for his sanitary achievements in Cuba and Panama, has been invited to advise on sanitary conditions at Johannesburg, South

A Natural History Reserve in Tunia.—It is reported in the London Times that the government of Tunis is about to establish a reserve to give refuge to the, at present, rapidly disappearing fauna of that country. It will include about 4,000 acres of wild mountainous country and an adjoining marsh of 5,000 acres.

Ammonia Bombs are being used on some of the national forests in this country to extragunal forest fire, sepecially in connection with brush fires, where the fire-fighters cannot get near enough to the burning area to be

Sir Aurel Stein, of the Archaeological Survey of India, is about to undertake archaeological and geographical investigations in central Asia and western China, in continuation of the remarkable work he did in those regions between 1906 and 1908. His journey to the border of Chinese Turkestan by way of the Pamirs will take him through the Darel and Tanjur territories, which have not heretofore been varied by a European.

The Calesona Beelle, an imported natural enemy of the gryps moth, is found to be multiplying very fast in the moth-infested territory of Massachusetts and seems likely to do much toward keeping this peet in sheek. This is only one of a dozen or more species of insects that are being used in the moth campaign, within a set of the moth campaign, within a set of the moth campaign, what, as American Forestry points out, the outlook is decidedly excurrently.

The King of England as a Meteorologist.—The London Times reports that King George has requested the Meteorological Office to supply him requiarly with Its daily weather map. Sir Frederick Ponsonby, in transmitting this request, replanted that 'his Mapsety has always taken a great interest in the chart and datalis concerning the barometer since he was on board H. M. 8, 'Thrush.'' The King is patron of the Royal Meteorological Scoisty.

A Census of Greenland takun October 1st, 1911.
shows a population of 13,459, as compared with 1,836
in 1901. The increase in the inter-vanue ten years was
the largest on record. There is practically no immigration, and the European population numbers only 384,
of whom 70 were born in Greenland, 286 in Denmark,
4 in the Faroe Islands, and 24 in other lands. The
largest scitionnent is Sydproven, with a population of
706; the smallest, Skansen in North Greenland, with a
population of 5

A Botanical Exploration of Amboina, in the Dutch East Indies, has been undertaken by the Philippine Bureau of Science with the interesting object of collecting, in their original localities, as many as possible of the plants described by G. E. Rumpf (Latin, Rumpfixes) in his monumental "Herbarium Amboineness," published in Amsterdam in 1741-1755. This work is of fundamental importance in the systematic botany of fundamental importance in the systematic botany of Hundo-Malayan region, on secount of the large number of species founded on Rumpf's descriptions, but the licitity of these is still uncertain in a great many cases. Dr. C. B. Robinson, of the botanical staff of the Bureau, is in charge of the explorations.

In catago or the expossions.

Karakul Sheep in Canada.—Consul Wesley Frost, stationed at Charlottolown, Prince Kdward Island, reports that a small flook of karakul sheep is to be imported into that province from Texas. Prince Edward Island has recently achieved considerable notoricly through its remarkably literative fox-breeding industry, and leading raisers of foxes are backing the new enterprise. It is proposed to cross the karakul sheep with the long-wood sheep of the island, which are eclotarised for the fine buster and strong fiber of their wool, in the expectation that a strain of hybrids will result having the tight ouris of the karakul at birth together with the gloss and strongth of the lond breeds.

The Evolution of the Rievator has not progressed to far in Europea as in this country, partly, perhaps, because the symmetry of Europea actives into the rimined with the skyeresper, so that the elevator is haddly anywhere an absolute necessity. An American consular report points out the fact that in the Old World three contraines are still regarded obietly as means of carrying passengers up, not down, an idea expressed in the names "devator." "Hit," and "seacessur," used, respectively, in America, Great Britain, and France. The commonst type of elevator met with in medium-priced hotels in France and Germany is controlled by a series of push-buttons on the outside at the bottom of the shaft. A person wishing to go to the third floor enters the ear, and an attendant who remains at the bottom for the shaft. A person wishing to go to the third floor enters the ear, and an attendant who remains at the bottom pushes button number three, the car stops at that floor, and the passenger, on leaving the ear, calls down the shaft that the ear is free. There is no corresponding provision for coming down—stairs are for that purpose.

## The Manufacture of Hydrogen Gas for Spherical Balloons

#### Portable Plants for Military Use

By the Paris Correspondent of the Scientific American

THE progress recently made in developing the spherical balloon and especially the airship for military or other uses, has caused increased attention to be paid or other uses, has caused increased attention to be paid to methods for producing hydrogen gas in large quantitles to meet the growing needs and in a sufficiently tate. Of late the extensive use of air countries as a part of the army outfit, has led to a countries as a part of the army outlin, has led to a search for suitable hydrogen-producing plants especially adapted for military use—Fixed hydrogen plants are of course useful in connection with aeronautic establishments and army centers, but what is especially valuable now is a portable outfit of this kind which can so that the airships can be supplied in the best manner By the adoption of a hydrogen plant mounted upon rati-road cars such as we represent here, it will be seen that the effective work of an airship will be at once inused, owing to the fact that it is constantly kept in good order by the available supply of gas. Wanting this, the airship would often be laid up, or at lea subject to more or less delay in carrying out its work.

A hydrogen plant of the present kind not only serves for aeronautic purposes, but the gas can be supplied from either fixed or movable plants for use in different electric welding of plates or bars, and similar work for which a considerable amount of hydrogen is needed at ent, also for cutting of plate iron by the hydrogen blowpips. The hydrogen-producing methods used mainly up to now are purely chemical, electrolytic, or regeneration processes, but all have their disadvantages supared with the present oil gas method which is ed by the inventors. In some cases the first cost or rative expenses are high, and in others the gas need

cheap electric power can be employed or in the other cases where a water gas plant can be installed to ad-vantage. In such cases the hydrogen needs to be trans-ported in steel bottles under pressure, which is an added cost. Some processes do not give a pure enough hydro-gen, one which shall be free from arsenic and chlorine, gen, one which shall be free from arsente and chlorine, and it is known that areenic has caused even mortal accidents in this way. As to chlorine, the gas for use in airships must be free from it, for chlorine attacks the balloon envelop.

According to the new German hydrogen process de-vised by Rincker and Wolter, the gas can be produced in any suitable place and the plant occupies but a small with a very cheap production. pact shape of the apparatus makes it very well adapted for mounting upon cars so as to give a portable plant for airships. In fact, it appears that the German army is much interested in the present method and expects to use it for supplying airships of its numerous fieet. The gas which is produced in this apparatus has but a small percentage of nitrogen and has a specific gravity of 0.087 to 0.092. The operation is based upon the use of crude oil to produce the gas, so that a supply is easy to have. Instead of this, the so that a supply is easy to have. producer can also be made to work upon benzine, refined oil, benzol and the like. Heating is done by the use of coke, as a general rule, although this can be replaced charcoal. In the large engraving will be seen the teral makeup of the plant mounted upon two railroad cars such as is designed for use in the field in army operations. In this apparatus the first part consists of the gas producer layout which is mounted in complete upon the front car, while the second car has

remainder of the plant, including the co remainder or the plant, including the court, Schools, and other purifying devices. This second part of the apparatus is especially needed for giving pure gas which airabips require, as otherwise it need not be as elaborate for use in other industrial processes where less pure

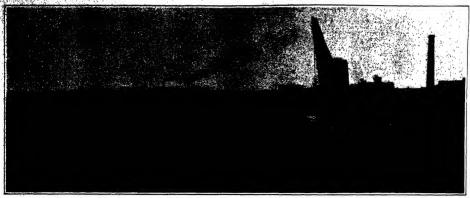
The main apparatus on the front car oor pair of gas producers. Each of these has plate iron casing which is lined with fireb remove slag and ash, there are two doors in the front which are kept closed while the gas is being p On the top of the apparatus is a hopper for use in field-ing in the coke. At the bottom of the producer are good-sized pipes which bring in the air blast from the blowing chamber. The first of the two producers also has an oil agray device for introducing the oil at the top part. The producer is filled up with coke as is coming from a steam turbine driven blast fan, this orked by the steam from the locomotive. If need be, the blast fan can also be driven by a gus or crude oil engine of the usual kind in the case of the portable plant, or with a stationary plant a gas engine, electric motor or any suitable mechanical drive

Oil for the spray is supplied by a spitable oil pump which feeds from a large tank on the car. It is nece sary to heat this oil before feeding it into the producer. the steam from the turbine is for this purpose, so that the heating is economically done. At the start of the apparatus, both producers are filled with coke and fired up. By the use of the hot air blast the coke is brought to a white heat, and

(Concluded on page 462.)



Portable hydrogen plant of the Experiment Corps of the German Army Engineers in the field.



A 200-ton crane lifting a complete turntable on board the British dreadnought "Monarch."
FINISHING A BATTLESHIP AT THE ELSWICK WORKS

## Some Notes on the Armstrong Works

#### A Pioneer in the Development of Modern Ships, Guns, and Armor

I N speaking of the great engineering firms of the prestent day, there are deriath names that may be termed generic. Such for instance, are those of Edison and Westinghouse in this country, Krupp in Germany, and Vickers and Armstrung in England. It is bayond the compass of this journal to give any ex-

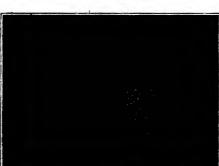
compass of this journal to give any extended description of a works which is so intimately associated with the lastnamed engineer; it is our purpose merely to give a few historical notes on the foundation and growth of the Aristroup concern, and a brief description of some of its ontput, as pictured in the accompany-

its output, as pictured in the accompanying illustrations.

To many who read these lines it will
come as a surptie to learn that Lord
Armstrong, the founder of the great works
under consideration, started in life as a
iswyer. But if he was a lawyer by profession he was an inventor by instinct
and natural endowment, and as early as,
the year 1886, his thoughts turned to the
promising possibilities of water as a motive power, and for several years he devoted his very fees mind to the study
of hydraulics. As the outcome of this, in
1846, we find him lecturing to the Literary
and Philosophical Society of Newcastle-onType, on the "Employment of a Column
of Water as Motive Power for Propelling
Machinery;" and a year later he exhibited
his hydro-electric mechine. Half a century later, locturing before the same socie-

Extended the control of the control of

ty, he spoke to his audience of the dense crowds that had collected in 1844 to see his hydro-electric apparatus, a crowd so dense that he had to enter the lecture room through a window. In 1846 the Royal Society elected him a fellow, and about the same time the first by-



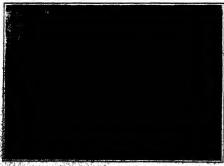
Instantaneous photograph showing the incandescent fragments of a shell which has broken up against a plate.

draulic crane was erected upon the Newcastle quay. So successful was this, that in 1847 an engineering establishment was opened upon the Tyne at Elswick. The success of the hydraulic crane was immediate and widespread; and upon the heels of this followed Armster and the succession of the succession

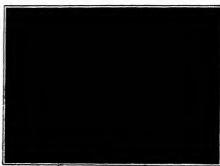
strong's invention of hydraulic mining machinery. The invention of the accumulator, which rendered it possible to employ hydraulic power where there was no natural head of water, gave a great stimulus to the new invention.

to the new invention.

The outbreak of the Crimean war brought Elewick for the direct time in touch with the British War Office. The heavy artiliery of the British Service had made practically no advance since the time of the Peninsular cumpaign and the battle of Waterloo, forty years before. Armstrong, with that distinguishing facuity of transferring his whole energy and attention to various subjects in turn, now became completely absorbed in the study of guns, carriages and projectless. In 1834, soon after the battle of lakerman, be designed and built a three-pounder built-up run which is still on exhibition as a historical relie at Elswick. It consisted of a core of steel enveloped in colled iron cylinders shrunk one above another. The gun was rifled and breech-loading and carried a movable ventpiece. In bringing this gun into general use there was the usual government anothy and inertie to over-



Pair of heavy gips on their terret turntable. Audrentic



To save room, this sarpeds tube receives its torpede from the side instead of through the breech.

come, but ultimately a committee reported in favor of the Armstrong system on every point; indeed, there was no rival system in existence. Armstrong laid before the committee an entirely new system of field artitlery, embodying in the gun a standard of accuracy and rahitherto unknown, and providing a piece that was com-

plete with carriages, projectiles and fuses.

The distinguished inventor now entered the government service with the title "Engineer of the War Department;" and he at once made a gift of his gun pat-ents to the nation. Just at this period the Elswick Ordinance Company was formed, and shortly thereafter Armstrong was knighted by the government in recog-ultion of his abilities and services.

In 1863 the British government repudiated their arrungement with the Armstrong Company and it was not until fifteen years later that the Elswick experts suc-ceeded in forcing upon the government their new type of gun, a type which with certain modifications is no adopted all over the world.

In 1869 the Ordnance Department of Elswick was started, and shortly thereafter there joined the staff of the company a certain Capt. Noble, a young artillery officer whose name was ultimately destined to become fumous as the leading expert on explosives in the world. Sir Alfred Noble is to-day head of the huge ordnance department at Elswick, and chairman of the company. Bereft of government orders, the company began to dish a foreign trade which has since grown to enormous proportions. Up to date, the Armstrongs have built for the Japanese Navy 13 ships, for the Chinese, 22; for the Brazilian, 11; for the Chilean, 2; and for the British Navy, 44 ships. The total output of the firm to date numbers 135 warships, with a total displacement of 565,029 tons and a total horse-power of

As a result of Capt. Noble's researches and experimental work, there came about a revolution of the whole science of gunnery; for by the introduction of slow-burning powder, he opened the way for the construction of an entirely new type of gun. This was completed and brought to the notice of the British government in April, 1877. Subsequently, that notable gunmaker, Whitworth, amalgamated with the Armgunnasker, whitworth, amalganated with the Arm-strong Company and a new company was formed under the title of Str W. G. Armstrong, Whitworth & Com-pany. In 1885 Armstrong opened up a branch for italian work at Poznolli on the Bay of Naples, where for twenty-six years guns and mountings have been built for the Italian army and navy Limitations of space prevent any further narrative of the development of the various branches of this firm, and it must suffic to say that in Newcastle alone, 120,000 men, women an children are dependent on the Elswick works for their

One of the largest departments of this firm is that devoted to ordnance. We present illustrations show-ing the method of mounting the large-caliber, wirewould naval guns, which are minufactured in such large numbers for the British and foreign navies. In onr own savy we use a purely electric method of control, both for training and elevating. The British have always used and still adhere to the hydrautic method, which they claim gives excellent results in speed and necuracy. A striking illustration is the one showing graph taken at the instant of impact of a 9.2 inch shell against a Krupp plate. The work done upon the plate and the projectile resulting in the generation of intense heat is very graphically shown in this picture. The particles of steel dust and fragments, highly incundescent, have been caught by the camera as they were scattered, white-hot, in all directions. The edo tube Illustrated is one of the latest pattern designed for underwater use abourd ship. In order to re the size of the torpedo room, the tube is form in two halves, one of which can be unlocked and open laterally as shown, to allow the torpedo to be inserted from the side. The tube is then closed up and locked by the manipulation of levers shown to one side of the

Warships built at the Elswick works have to pass telow a high level bridge, farther down the Tyne, on their way to the sea. Hence the peculiar appearance of the Iripod most of the ship, shown in our engraving It will be seen that the mast is broken at the level of th smokestack, the top half of it being carried temporarily upon scaffolding, and subsequently riveted in position.

#### The Use of Cocoa Shells as Fodder for Cattle

A 18E has been found for the cocca shells which are A is product of the chocolate industry in France as fodder for cuttle. The cows like it and it is nourisdiscipled to the constant of the core USE has been found for the cocoa shells which are ing and fattening, having much the character as wheat ing and fattening, having much the character as weath-bran, but it is thought by some authorities to iessen the milk yield, though not lowering (but even increasing) lis fatty content. A report on the subject has been made by an agroundic equipeer named Lucas to the National Society of Agricofiture of France. The ques-

tion is to be further studied and is of importance, as this product consists of no less than three to five mil mes yearly, according to Les Annales

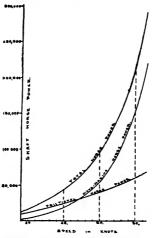
#### The Problem of High Speed in Ships

NOT many people understand why, in the higher branges of speed, it is so difficult to add another knot or two to the speed of a fast ship. To the naval architects of course, the problem is a simple one. Not so to the layman, who, generally speaking, cannot un-derstand why such a great increase must be made in the horse-power to gain the last knot or two. One of the most lucid explanations, of a popular character, of this problem is contained in the last issue of the Skipping World, in the form of an article contributed by a member of the Institute of Navai Architects of Great

a member of the Institute of Naval Architects of Great Hritain. We republish the diagram accompanying that article, and the following is a digest of the paper. The writer (M. I. N. A.) of this article was prompted to take up his yes by observing the ridiculous press statements as to the speed of the "Queen Mary", the latest of the British battle-cruisers, when she was on her trial. Nhe was designed for 28 knots, and it was alleged in the press that she attained a speed of 85.7 knots and was expected to do better when the crew ecame more familiar with the ship.

In order to indicate what expenditure of power is

involved in increasing the speed of a vessel, the accompanying diagram was prepared, showing the horse power necessary to drive a ship of the dimensions of



The shaft horse-power of a battle-cruiser at vary-

the "Queen Mary," 660 feet long, with a displacement of 27,000 tons, at speeds intermediate varying between 19 and 36 knots. At the designed speed of 28 knots the total shuft horse-power to be developed is 70,000. In order to reach the speed she has been credited with, 35.7 knots, the shaft horse-power necessary would be about 244,000, that is, about 3½ times the power that she was designed to develop under ordinary circum stances. That the unchinery could never develop any-thing like this, needs no demonstration. The diagram shows that at 28 knots the horse-power is 70,000; at 29 knots, 81,000—an increase of 15.7, per cent. At 35 knots, \$3,609—an increase of 15.7, per cent. At 35 knots the horse-power is 213,000, at 38 knots 225,000, or an increase for this advance of 21.1 per cent. We can thus see, that, at the lowest speed, 11,000 horse-power is required to increase the speed by one knot, and at the highest appear of \$5.00 knots, and at the highest appear of \$5.00 knots, and at that a by no means an extraordinary case; for in that this is by no means an extraordinary case; for in the case of some ships it would take double the power is transmitted. to increase the speed by one knot. It is possible that the "Queen Mary," with a designed horse-power of 70,000, has reached 29 knots and a trifle beyond, but that in itself is an exceedingly good performance.

The resistance to motion of a side, through the water

The resistance to motion of a supplicitioning the water consists practically of two parts—the frictional resistance due to the rubbing of the water against the underwater part of the ship, and the resistance caused by wave-formation. At the higher speeds, large waves are formed-that is to say, heavy man

mounly being lifted above their normal level; and continuously being introd above tours specially activities, as anyone can understand, requires a consistent into large expenditure of energy. At low speed, rictional borse-power is greater; at above 27%, for the frictional and wave-malding borse-power are sequenced. After that the frictional horse-power increases a liftle faster than the speed, and the horse-power necessary to roll up the ever-increasing waves formed by the ship's progress rises at an

#### Is the Panama Canal Liable to Damage by Earthquakes?

By Charles Davison, Sc.D., F.G.S.

THE recent occurrence of three rather severe earth quakes and of many others of less intensity in Panama has naturally drawn attention to the possible effects of still stronger shocks upon the canal. generally held, I believe, that the danger is so It is that it may be disregarded. It is pointed out that the region is one in which earthquakes have in the past region is one in which entroquases have in the past been rare and almost innocuous. And, to this, it is added that, owing to its geological structure, slight-tremors, if anything, rather than destructive shocks, may be expected to occur in the lathmian district. For both reasons, there is much to be said, but neither seems to me quite conclusive. It does not follow that

a country in which strong earthquakes have been infra country in which strong earthquases have been inter-quent or altogether absent for several centuries will remain immune for yet another century, though it is vory probable that the present condition of stagnancy will endure indefinitely. But instances to the contrary are not unknown. The strong earthquake of 1884, which caused so much damage at Colchester (England) and the neighboring villages, occurred in a district in which no recorded earthquake has ever originated and in which none but slight shocks have been felt. State of South Carolina was by no means celebrated for strong earthquakes when Charleston was partially destroyed in 1886. Nor was Alaska known as a distincseismic district until 1899, or perhaps until 1995, when the evidences of the greatest record d earthquake uplift were revealed to Messrs. Tarr and Martin.

Again, too much stress should not be laid on the

rarity or absence of actively-moving faults in the Isthmian zone, for surveys in mining districts show that faults may exist at the depth of the mines which a survey confined to the surface would not have detect-ed. Nor is this all, for, as in the Swanses earthquake of 1906, the seismic cridence may indicate the exist-ence of still more deeply-scated faults, which the most detailed observations either on the surface or in mines would never have revealed.

But, though it is not impossible that destructive ocks may occur in the immediate neighborhood of the canal, it seems on the whole probable that the prospect of any damage resulting to the works is but a small one. It should be remembered that the epicenter small ones. It should be remembered that the epicenter of the recent earthquakes was at a great distance from the Isthmian zone. It is true that, on October 1st, a few walls were cracked in Panama City, but the chief damage occurred in the provinces of Los Santos, and expecially at Touosi. As most of the after-abotics were felt in the same district, it is probable that the epicenter of the earthquakes was not far distant. If we take it to have been about a hundred miles from the canal, it follows that, to cause serious injury to the workings, the meizosetsmal zone would have to attain the considerable area of about 30,000 square Unless, thorefore, there should be a marked oce of the epicentral sone toward the canal, it would seem that little danger is to be apprehended earthquakes originating in the Los Santos center.

But, even if a violent earthquake were to occur at some place much nearer the canal, it does not follow that the works would be seriously injured. Twenty-five years ago some interesting observations were made by Messrs. Sekiya and Omori at Tokyo. Two similar setsmeasure, sestiva and omore at 1000. Two similar seits-mographs, which had previously been compared on a shaking table, were placed, one at the hottom of a pit 18 feet deep, the other-on the surface close to the pit. The records given of the earthquakes of two years (1887-1889) were afterward compared. If the earth-quakes were slight, it was found that the records on the surface and in the pit were nearly the same. But. if the earthquakes were strong, the differen once noticeable, not so much in the large undulations as in the small tremors or rippies superposed on them. as in the small tremors or rippies superposed on them.

In the pit, the rippies were to a great extent smoothed away. If the intensity of an earthquake short depended only on the range of the motion, this would not be of much consequence. But it depends also on the irrevity of the period of the vibrations, and, on this account, the ripples possess an intensity several times got than the large undulations. The effect of smoot away the ripples is thus to reduce the actual inte of strong earthquakes, so that at the bottom of the may be only about one fifth of that at the surface."

1 Japan Seis. Noo. Trans., vol. 16, 1899, pp. 19-48.

and the second of the

#### Correspondence

The editors are not responsible for statements of the correspondence column. Anonymous consumications cusmos be considered, but the names orrespondences will be withheld solom so desired.

#### Increase the Putent Office Force

To the Editor of the Schemers American:

I am heartily in sympathy with the sentiment and suggestions expressed in the article, under Correspondence, entitled "A Pies for an Increased Patent Office Force," appearing under date of October 25th of your

valuable paper. I think we need more discussion along this line in rder to awaken public interest in this matter.

HOWARD N. WEDDLE. Idonba (isl.

#### Air Corepres sors in Whale Catching

To the Editor of the SCIENTIFIC AMERICAN:

Reading an article on novel uses of compressed air which appeared in the SCHENTIFIC AMERICAN of July 5th, 1913, recalls to the writer a rather novel use of com-1913. rec d air which I do not think is known to your

Some of the steam whaters that carry on the whate ery off Tierra del Fuego are equipped with West-house steam-driven compressors like those used on the locomotives to operate the air brakes, and when a whale is killed and the tow line attached, a hollow a wraze is which a hose attached is thrust through the blubber and the air compressor started. This inflates the carcass of the whale and facilitates towing & to the station where the try works are situated.

J. P. STORE

#### The Double Report of Gun Fire

To the Editor of the SCIENTIFIC AMERICAN; In an article you published some time ago on a visit to the Atlantic fleet during target practice, the writer to the attention need during target practice, the writer speaks of hearing a double report when a shell from one of the small guns passed near their ship. He states that one of these reports came from the gun, but the the officers of the fleet were not sure as to the cause of the other.

I mentioned this recently to a friend who has seen active service in the Philippines, and he said that he had often noticed a sharp report when a steel-jacketed bullet passed overhead, and that when the bullet passed that of the rifle. This noise is not noticeable in the low-velocity lead builet.

I mention this is case there are any of your readers who are interested in this subject.

Baltimore, Md.

AUGUST MENCKEN.

#### Automatic Sprinklers at See

To the Editor of the SCIENTIFIC AMERICAN: In your editorial on "The Peril of Fire at Sea, is your entorial on "the PPFII of FIFE at Sea," In issue of October 25th, 1918, the question is asked, "Why is it that the automatic sprinkler, which has proved so highly efficient ashore, has not been applied to the tection of ships?

I beg to inform you that automatic sprinklers have been installed in a number of steam vessels plying the Great Lakes and Long Island Sound. I have before stographs of two lake steamers that are partially protected by sprinklers. As you say, "structurally con-sidered, the problem should not be a difficult one." And the problem of water supply is easily solved by the provision of automatic Underwriter fire pumps, or air-pressure tanks, maintaining constant pressure of water on the sprinkler system at all times; and where there is danger of freesing, the installation of a dry-pipe system will obviate that difficulty, as is the practice

Now, Mr. Editor, the answer to your question is, that sprinkiers are not installed generally in ships for the same reason that they are not installed in all factories. The owners will not pay for them; it is so much easie. to "take a cha P. D. C. STEWARD. Philadelphia, Pa.

#### The Busiest Railroad Terminal

The Busicet Railroad Terminal
To the Editor of the Scurwirzo Auguston;
A paragraph in Engineering Notes in the October 18th
number, gives the impression that the busicet railroad
terminal in America is the South Station at Boston,
rit will probably surprise most of your readers to
learn that the "Busice Terminal in America" is not in
Boston, spe in New York, nor yet in Chicago, but is in
fact on the other side of the southest entirely.
The busiless of the Union Ferry Lepoch at San Francisco surprises, oven that of the South Station at Bostops, by over; a million and a half a year.
San Francisco is so situated that nearly all pessuggest sculing; the city are compelled to do so over

conners reaching the city are compelled to do so over

alor of the

the ferry lines of the various railroads, all landing at the Union Ferry Depot.

For the fiscal year ending June 80th, 1913, the official figures give a total number of passengers handled

as 89,955,578 distributed as follows: San Francisco-Oskiand Terminal Hantways
Western Pacific Railway
Santa Fé
Northwestern Pacific 89,362 299,987 488,989

Monticello Steamship Company ..... Oakland, Cal.

#### Spreading and Overturning of Rails

To the Editor of the SCIENTIFIC AMERICAN:

I write this for information concerning "spreading rails." Do rails spread and cause wrecks on railroads or do they turn over?

I think there is a difference between rails spreading and rails turning over.

and rails spread the rails would be pushed out at base of rails and spikes would be pushed out from rail on outside or else their heads would be sheared off.

If rails turned over then the spikes are pulled on the inside of rails.

In my opinion we would not hear of rail spreif angle bars at rail joints did not get loses and allow pounding at joint, with the result that the wheels push the rail over at joint and turn the whole rail over. This is the option of a man that was for thirty-five years a trackman on a first-class railroad, and had as

uch experience with wrecks as almost any man, and I think he was right.

Will some one better informed entighten us on the ZACH T. HOSKINS. subject?

Chicago, Itt.

Cour correspondent is correct in his explanation of the action of the rail on the spikes in the respective cases of turning over and spreading. Low joints, in our opinion, are only one cause tending to produce reading and overturning by setting up oscillations of the engine and cars.-Entre

#### The Use of Oil at Sea

To the Editor of the SCIENTIFIC AMERICAN:
Not enough attention has been paid to the use of oil
in the reacne of the "Voiturno's" passengers.
The great increase in the number of lifeboats since

the "Titanic" disaster is shown not to have solved the problem. Even with the most improved davits, boats pronem. Even with the most improved dayits, boats cannot be launched in a high sea. From a height like that of the decks of the "Olympic" or "Imperator," the boat and passengers will be lowered to certain destruc-

The use of oil has often been shown in such cases. Every tug with barges in tow should be compelled to take a supply. Seven lives were lost off Cape Cod inst week, following hundreds of others. If oil were used e tugs could take the men off the barges in any weather; whereas now they are compelled to let them drift to destruction.

Life savers along the coast could throw oil, in rockets or projectiles, to windward of a stranded vessel, and greatly increase the chances of saving the crew. Patent Office records are full of such devices, and no doubt the simplest would be found the most effectual.

The Ordnance Department of the Army would be well imployed in co-operating with the Life Saving Service in perfecting such a projectile. The Revenue Service could use oil freely in the many rescues they are called on to make. The device is an old one, but its use should be modernized and made effective, and no ship should be allowed to sail without proper equipment for the use of oil, for the safety of its own passengers, or saving the lives of others, found in danger.

New York city. TOURSE D. HOLMES

#### To Our Subscribers

W.E are at the close of another year—the sixty-ninth of the SCHENTIFIO AMERICAN'S life. Since the subscription of many a subscriber expires, it will not be amise to call attention to the fact that the sending of the paper will be discontinued if the sub-acription be not renewed. In order to avoid any in-terruption in the receipt of the paper, subscriptions should be renewed before the publication of the first of the new year.

To those who are not familiar with the Scientific American Supergraphs, word may not be out of place. The Scientific American Supergraphs contains articles ction in the subscription price.

#### The American-French Radio Time Signal Experiments.

THE Naval Observatory succeeds in receiving time signals from the Observatory of Paris by radio telegraphy via the Eiffel Tower and Arlington, for longitude determination.

For about a month the Naval Observatory at Washington and the Observatory of Paris have been sending time signals to each other, using the Arlington radio station and the Elffel Tower in a campaign to determine nce of longitude between the two pla the velocity of propagation of radio signals through Owing to interference from other radio stations, but principally to discharges of atmospheric electricity, there has not been much success until the night of November 19th, when the beats of the Paris clock as transmitted by radio signals were compared with the Washington clock for some minutes by the method of coincidences. The season of the year when atmo-spheric conditions are best for radio work is now coming on, and it is expected that the work in which the can and French commissions are engaged will proceed as planued.

e Naval Observatory was the first institution in the world to have its time signals regularly transmitted by radio telegraphy for the benefit of ships at sea, enabling them to check their chronometers and thereby better determine their longitude, and it also has sent signals in this way to enable surveying parties under the Hydrographic Office to determine the longitude of points which they used as bases.

Although radio signals travel through space at approximately the velocity of light, there is a slight but appreciable loss of time (a small fraction of a second) in starting such a signal on its journey away from the serial of the sending station and in receiving it at the other end. It was desirable to eliminate this loss of accurately measure it, and the observatory was considaccurately measure it, and the observatory was considering this problem in 1912, when it was ascertained that the French had already solved it by one of the methods which were suggested for study, viz., that of "coincidences." Here was a beautiful solution and the superintendent of the Naval Observatory, realizing its possibilities, proposed that steps be taken to arrange with the French government to exchange signals been the Eiffel Tower and Arlington

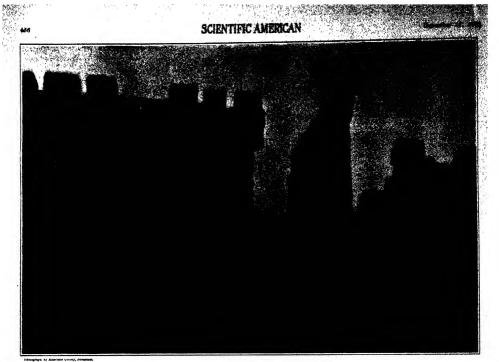
The Navy Department would have been content if granted simply the privilege of taking its own astro-nomical observations in Paris and using the Elffel Tower radio station for sending signals, but the French gov-ernment showed the keenest interest in the problem, and last spring sent five of its leading experts to this country to study il, while the Navy Department had representatives in Paris for the same purpose As a result of these preliminary investigations it was agreed that there would be an American and a French commission which would work side by side, but independently, cach commission having a party in Paris and another in Washington at the same time, until one balf of the observations and exchanges of signals were completed, when these partles would exchange stations, taking their instruments with them, and repeat the process.

The interval since last April has been devoted to get ting ready. Two special telescopes have been provided for the American parties, which are designed to elim-inate as far as possible instrumental and personal errors, and the exchange of stations is intended to still further eliminate such errors from the final results. Two instrument houses have been built, side by side, at the observatory, identical in design, one to house the French and the other the American party. These houses are considered models of their kind and will be available for future use in similar work.

Four radio experts were ordered from the fleet to the Naval Observatory to get the necessary experience to enable them to compare the clocks, separated as they are by about 3,800 miles, and to assist in making preparations. Two officers who had had experience in hydrographic surveying were also detailed to join the astro-nomical staff of the longitude campaign. A great many details had to be studied and tested at the observatory in preparation for this great undertaking, as the apparatus in Washington and Paris differ considerably.

The same signals which are set by the Arilington

radio station for the Naval Observatory are to be used by naval hydrographic surveying parties in the West Indies and Central America, and fifteen observatories scattered from Maine to California have already indicated their desire to take advantage of them to deter-In this way the undertaking inaugurated by the Naval Observatory will have a far-reaching scientific and practical influence, and that observatory already is considering a still more fur-reaching underlaking, namely, that of tyling together the continents of North and South America and many of the Islands of the Atlantic and Pacific, and possibly some of the countries in western Europe, by longitude determinationbased on radio signals to be sent from the radio station to be built by the Navy on the l'anama Canal Zone



The cyclopean wall and lofty pillars of the Great Temple, Baalbek.

## Baalbek the Mysterious

#### In Many Respects the Most Famous Ruins of Bible Lands

By Harold J. Shepstone

A MONG the grandest relies of a great nation's vanished giory stands the ruins of Bauliek, certainly one of the most mysterious of ancient cities. These ruins in Kyria are rightly renowned for their massiveness and for the great mount of both bold and delicate carvings with which they are adorned. An account of them is appropriate, for through the German excavators, under Dr. Sabelsinian and Prof. Puchsielan, who have been tolling here for four years now, much new and interesting light has been thrown upon the history of this once famous city. Indeed, these savants may be said to inve done for Bauliek what Layard did for Mineveh and Babylon and Schielmann for auceint Troy. Still it must be admitted that the work of the Germans has not been altogether a dishietered on, for the Berlin museums now possess unny of the finest examples of carvings found here.

These wonderful rains, he some respects the most frames in Bible lands, the in the narrow pleturesque valley of the Linuin short distance west of the Bible lands, the in the narrow pleturesque valley of the Linuin short distance west of the Bible lower of Bundlack, at an attitude of some 4,000 feet alrews see level. The town is about ten unless north of the railway which runs from hefurt to Damascus. To visit the ruins, therefore, one goes by train from Eleptra to El-Mundiaka, from which place they can be reached in an hour or two by carriage. Here the ancient Agayrians wondinged Band, the Greeks Hellos, the Got of the Sun, and the Rumans Junjee. The early Christians, to, worshipped the Gol of Jedovach at ancient Bandlock, turning the great pagan temple into a thristian sharine. They, in turn, were driven out by the Arabe who converted these wonderful old temples toto forteresse.

Although Inscriptions and tablets found make this very char, we have, nevertheless, very little knowledge of ancient Basiles. Its history is lost in the thick obscurity of a very remote past, and even its existence was for centurel utterly unknown. The extraordinary silence of the ancient Greek and Roman writers concerning a plane so accerancy avoidintly, important, and magnificent is supercontable. John of Anticol is the

only medent author by whom it is mentioned. And he was wrong In many of his statements. He ascribed these ratios to Alins Antoninus Pius, decisting that he built the great (cuaise at Heliopolis, near Libonous, in Phoenicia, which was one of the wonders of the world in the early days of the second century. Inscriptions found by the German excavators would go to show, however, that the great temples were begun by the Homania in the first century after Christ, and this view is also confirmed by the Nyrian writer Michel Alonf, who is a native of Basileic, and who has devoted an immense amount of time to the patient study of all

documents bearing upon the blatory of his birthplace. Virtuals written speak of Rashbek at the period of the first Arab lavasion, describing it as being then one of the most spiteadd of Nyrian cities, having stately paience adorned with monuments of great antiquity, abounding with fountains and article adornments of wonderful richmess, variety, and beauty. It ecommercial importance is shown by the fact that during its siege by the Mosiema, shartly after the fall of Damascus, the citemies captured a caravan bearing four hundred loads of silk, sugar, and other commodities; and its wealth is ascertained by the ransom that was executed, of two thousand ounces of golf, our thousand ounces of silver, two thousand ounces of silver, two thousand ounces of silver, two thousand ounces of silver thousand silk wests and a thousand sworth, in addition to the arms borne by its defenders.

Most visitors to Itanibek find the ruins confusing and somewhat hewildering Indeed, seen at a distance that are a little dissipointing, but once you stand among them and survey the messive columns, matche doors of predictions dimensions, windows and niches bordered with exquisite sculpture and fragments of besutiful niches, cornices, capitals and entablatures, you are amazed and mystified ul it all. Yet all these ruins only represent the romains of two grand temples and a smaller one—the Great Temple, or Temple of Jupiter, the Temple of Bacchus and a small circular Temple to Vonus. Nevertheless, in the colossal walls of this anietest Nyrian acropolis one could place many of the ruins of ancient Rome. The architecture of four, it

not five ages, is represented—Phoenician, Greek, Roman, Christian, and Sarucenic, while some authorities consider that there are distinct traces of Solomonic architecture.

arentecture

The rulns stand on an artificial oblong plateau of masonry, probably of Phoenician origin, about 331 ayards long by 200 broad, and varying in height from 15 to 30 feet. The enormous extent of this vast enceints may be better realized when it is remembered that the main courtyard, which serves as the approach to the Great Temple, is nearly 150 yards long and some 120 yards wide, dimensions only surpassed by those of the Great Temple at Karnak, in Upper Engyt, Beneath this colossal platform are vaulted passages like tunnels, and it was from these passages until somewhat recently that the temple area was reached.

First and foregood among these rulns therefore comes

First and foremost among these ruins therefore comes the Great Cresple. Its main entrance was from the east. Hore a wide flight of steps led up to the propries, ninetees feet above the gardens and orderade that now surround the ruins. This portice was opened to the east the full width? of the water said the worshippers used to ester between rows of columns on the bases of three of with are inscriptions stating that the temple was erected to the "Great Gode" of Hollopolia. When the Arabs compared the city they converted these temples into fortresses, and to this end to a certain create irmodeled them. The columns mentioned were removed, the statrense taken away, and the statrense would be the continue that the columns had been. The German excerntors have form away the wall constructed over: the bases of this columns had been. The German excerntors have form away the base of the columns of the columns had been and the columns of the columns had been. The German excerntors have form away the bos. The German excerntors have for the columns had been. The German excerntors have form away to be so that today one enters again as giffel the Rosan worshipers of old. Indeed, every vigities; to the critical plan more selfy comprehensible. Those of deficies have been removed and weak jearls in the ruins have been strengthened.

From the Propylets one passes to the hexagonial fore-

THE RESERVE TO SERVE THE S

while it makes if a combact desirant with a smaller of a class of the Tolk small court was surrounded by a gricumsta and an four of the fit affect by excites or schools chamblest. The Arabe size bleated this threads excites and cases what he eagens told fortification, littles their with thick mesours. Through the great bleat of spices which has until lately blocked the cartrainte here, the excevators have out an opening.

seems of the second to the seems of the second of the seco

In the center of the court, rather nearer to the stope seconding to the temple beyond, stands what is left of the large aitar. On each side of it is a pool or beath used for ablution in connection with the religious rites here observed. It was only during the recent excursions that the aitar ing the recent excursions that the aitar

was discovered and also the stops by which the priests ascended at the time of secrifice. When these temple were taken possession of by the early Christians a church was exected over this altar, part of which was church was exected over this altar, part of which was church was exected over this altar, part of which was church the cherrch floor was above the top of the altar. The lower part of the staircase was also filled over while the upper part was removed to accommodate to the appear. The Great Temple beyond was demoliabled to turnish materials for the construction of this church. The idea of these early Christians was to obliterate heathenism by placing this Christian byttse right in the center of this resourced temple of the heathen gods. As it seemed to work in best, the apses were placed as above described on the west with the surtance from east. Later this was considered unothedox and as

agas or agass were built at the west end so that now faces; of them agaser at both extremities of the ruin. From the spectous cept of the altar one passes by means of a wide flight of steps into the Great Temple itself. All that is now left of it, however, are six columns which formed part of the perityle still standing is still capped with Corinthian capitlas and joined by an ornate and massive entablature. They are perhaps the crowning feature of Bashok, and ptercing the sky-



Block of ceiling in peristyle of Temple of Bacchus, Baalbek.

line as they do are seen long before the rulns are seached. Prof. Taylor says of them: "I know of nothing so besquitful in all remains of ancient art as these six columns..., Prom severy position, and with all lights of day or night, they are equally perfect." From A little distance their perfect proportions make them appear smaller than they actually are. A wall 40 feet high forms a fit pedestal for these magnificent columns. They are 7% feet in disaster and with their bases and Corinthian capitals tower 70 feet into the sir, the whole being crowned by a graceful existalure some 15 feet in height. Each shaft consists of three separate places of some held together with Iron. The Turks have barbarously made incisions in the columns at several places to order to remove the from crawnal

eral places in order to remove the iron cramps.

Now the ponderous stones which form the colorest

cornice were raised in position and places at gizantic but graceful columns is a provided engineers as much as savants and quarians. The most plausible solution suggested that a sloping embankment of earth was built from the quarry a quarier of a mile distant to the top of the perityle, and the stone drawn on rollers by thousands of slaves, the method resorted to by the ancient Expytians when they built the great Pyramids. The

numerous mounds of earth still to be seen in the great court piled against the wall give some color to this theory.

So much for Baalbek's first and most famous ruin. We now come to the second. the Temple of Bacchus, which ites to the south of the Great Temple, entirely indeent of it and on a much lower level. It had no court, but was entered by a flight of steps from the east. The walls of the cella, which is oblong, are quite pisin on the outside and are built of carefully dressed stone, the joints so perfect that a knife blade cannot enter between. Around this at a distance of ten feet, on the two sides and ends, runs a row of smooth columns which form the Peristyle. These, including their capitals, are about 52 feet high and are surmounted by a magnificent entablature and connected with the walls of the cella by enormous slabs of stone which are chiborately carved with the heads of emperors, deltie interwoven with floral designs, forming ost unique celling. While the wails of the cells are still perfect, more than half of the columns forming the peristyle have failen, the north side being the best erved. Here in a niche may be seen a tablet commemorating the visit of the German Emperor to these rules in 1898.

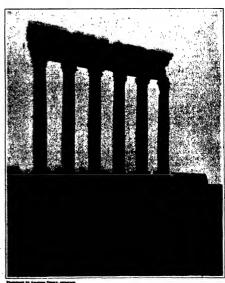
Nowthits anding the profuse or namentation of the peristyle it is exceeded by that of the portal to this temple, which is indeed the gem of the entire edifice. The door posts are elegantly carved with figures of Bacchus, frawa, cupida, sutrys and bacchantes, woven around which are grape vines and clusters of ruit, also popples and ears of wheat, all of which are symbolical of the reveiling which the temple suggested. This great doorway stands 35 feet high and 21½ feet wide, within the curving of the posts just mentioned covers a space about air feet wide. On both addes of this door stand graceful fluted columns forming the provide or profuce, while the plain ones of the peristyle, which stand behind them, seem to reflect their beauty. As a furgast years of those two incubes attended to the peristyle, which stand behind them, seem to reflect their beauty. As a furgast years of those two incubes attended.

(Concluded on page 462.)



Builes of the morque, once a Christian church, Baalbob

A Particular Control of the Control



Lofty pillars of the Great Temple, Basibek.

#### An Apparatus for Automatic Transmiss and Reception of Wireless Messages By Lucien Fournier

THE apparatus described below is based on the prin-lepis of the phonograph. It comprises, in the first place, a cylinder of wax on which a sapphire-pointed tool inscribes Morse telegraphic symbols, giving the proper length to each letter and to each space bet letters or words. To the record thus pro-duced is applied a needle, which follows

duced is applied a needle, which rollows the trace made by the graver. The re-producing needle is connected by a lever to a key which operates a wireless transmitter

The dispatch thus automatically iaunch ed into space is received by means of a similar apparatus, connected with the re lay of the receiving station. The currents of this relay, by traversing the coils of an electromagnet, operate the graver, which records the message upon a second wax cylinder.

In either case the cylinder is turned by a small electric motor placed in the base of the apparatus. The axis of the cylinder is connected by a belt to the motor and by gearing to a horisontal shaft, which mova sliding bridge or carriage by means of a comb and a helicoidal screw. The bridge can be brought back to its initial position

by pressing a lever.

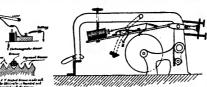
The sliding bridge carries a platform upon which the graving, reproducing and obliterating tools are mounted. The graver is attached to a bent lever pivoted to the The free end of this lever is connected by a silk cord to the armature of an electromagnet. When a current traa the electromagnet the armsture is attracted and, by the intermediation of the cord and lever, the sapphire point is forced into the wax cylinder. When the current ceases the graver and the armature are brought back to their original positions

The reproducing needle acts in a different manner. In order to bring it into contact with the grooves of the cylinder, the platform must be adjusted by means of two elevating and lowering screws is adjustment has been correctly made, the point the needle enters the groove and follows every indentation made by the graver. The needle is attached to the short arm of a lever, pivoted to the platform, and its movements are transmitted, in amplified form, to the curved end of the long arm of the lever, which, by pressing on a fixed metallic contact piece, automatically performs the functions of a morse act, and breaks the current of the wireless transmitting apparent to manned by a spring. The Perfect contact is assured by a spring.

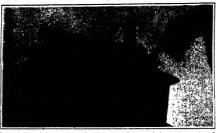
message recorded on the cylinder, therefore, is trans mitted automatically and with perfect accuracy

The sliding bridge also carries a third tool, called an obliterator, which is brought into contact with wax cylinder in order to efface the record of the

We have said that the cylinder is turned by an electric motor, but this is done only in the automatic transmission and reception of messages. In making the original record of the message to be transmitted the cylinder and the graver are operated manually by means of a special mechanism, placed in the base of the apparatus. This mechanism has three levers or keys. The middle key acts on the cylinder only and has no electrical connections. By pressing it turned by means of a wheel and ratchet, through the space between consecu-tive letters or words. Each of the other keys is simiof the other keys is simi-iarly connected with the cylinder by a wheel and ratchet, and also carries a flat spring, the end of which supports the end of a simia galvanic battery. When the key is degreemed the apring attached to it, which is will in contact with the battery spring, airlies the top of a vertical metal of which is surrounded and supported by a spiral rou when is surrounced not supported by a source spring, and is connected with the electromagnet of the graving tool. Thus the electromagnet is energised and the supplire point is pressed into the wax. At the same time the cylinder is turned through a shorter or longer are, according to the key used, so that a dot or



Diagrammatic view of the apparatus, as sending key.



General view of the apparatus for the automatic transmission and reception of

a dash is recorded. The travel of the key lever is rather long, but the duration of the current is limited by a stop which arrests the descent of the battery spring and breaks its contact with the spring a to the lever, while the key is still descending and turning the cylinder by means of the wheel and ratchet. This short currentless interval affords the graving tool time to remove itself and its shavings from the groove. The action of the dash key is identical with that of the dot key, except that the former pro-duces a longer current and turns the cylinder through a greater arc.

in order to transmit the mes



liar tapered etern behind the step, and the small floats beneath the lower plane.



SIDS YISW OF THE PUTING BOAT GATHERING MEADWAY. on of the men and motor, and the clearan propellers and surface of the water.

A new twin-propellered hydro-acroplane.

it gives the form of then if

said that the app

ages which from any trans For this purpose it is only to interculate the electromagnet by means of a suitable commuta circuit of the relay of an ordi ing station. The currents produ relay, traversing the electromagn the graver to operate in condi with those in which the original rec ord was made, except that the cylinder is turned with uniform speed by its electric motor. As the signals are being received and registered, they may be heard by means of a "busser" inserted in the dir-cuit of the electromagnetic graver. A wireless message can thus be heard as distinctly as an ordinary telegraphic mes-AR EG

In this last application the motor that drives the cylinder is started by the first call of the sending station, but, in order to eliminate the action of stray waves, the circuit of the electric motor is br by a clockwork if the call is not repeated within a certain length of time.

This apparatus, the invention of M. Leon Champeix, is capable of rendering important service in wireless telegraphy, by mak-ing possible a very accurate transmission and the repetition of a dispatch that has not been satisfactorily received. In receiving, the advantages of the apparatus are still greater, as the received and registered measure can be read at leisure by turning cylinder with any desired spe ity-now of freque obviating the neces

occurrence—of compelling the sending station to repeat the message several times.

#### A New American Flying Boat

DURING the past summer Mr. Orville Wright has Deen experimenting with a new hydro-aeroplane of the flying boat type, and he has recently brought out a machine which will undoubtedly find favor with all sportsmen interested in aviation

portunen interested in aviation.

The first Wright hydro-seroplane, it will be rememreed, was of the twin float type, and was built for

if. Russel A. Atger and flown for him by Aviator

application of the series of the seri

is not in a tight place in case the machine dives into the water, and also because he believes it to be more seaworthy. After experi-menting with this type for some time, however, Mr. Wright, aided by Grover C. Loening, the author of "Monoplanes and Biplanes" and the present superin-tendent of the Wright factory, has evolved the new flying beat shown in the ac-

companying illustrations.

The new Wright fiying boat is different in several respects from the Curtiss and from those which are copies of it. A small Wright biplane is mounted low down on top of a hy-droplane hull and contains the motor on its lower plane much as in the ordi-nary land machine. Insary land machine. In-stead of having a long up-wardly electing, topered stern or tests, that a butto-strick has a single per-sions to the middle, tapers shows to the middle, tapers there to the safe shoul last ware successful to the rand-ders of the a or opian a. These are supported on the usual four outriggers used

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## Catalepsy in Insects

#### Experiments Showing How Insects Pass Periodically into a Trance

By Percy Collins

Extent experiments with a spectos of Phasmath, and conditions by Fatar Schmidt, Petvat Dosent of the Imparial University of St. Petratuburgh, have brought to Right the ascendiding fact that these insects pass periodicily fatio a scate of databapty or transc. The spectos in question (Gerdessels sucrosse) is a native of Northern India and Aghandrau, but for none years past it has been beed extensively in the ishoratories of Europa. St secretarily provide, and is this well adapted for Europeas of experiment. In common with most other Phasmathe, its forms is slender and stem-like, according is a requestrable manner with the twigs and branches of the piratus upon the leaves of which it feeds. Its fabilits are almost exclusively nocturnal. During the dayling it rests motionless in a characteristic attitude—the fore legs being brought close together and extended in a line with the body. In this pase its sticklife form and green color combine to vost it with a most perfect conocaling resemblance to its surround-

In the past, the long hours which this and certain other insects pass without evincing the slightest sign of animation have been regarded as periods of normal without disturbing their death-like signaber. Schmidt points out that these results are entirely in accord with what we know of catalegitic phenomena in general, vis., that the subject does not feel pain, and that the nuncies are not susceptible of fatigus. Et a lace emphasizes the fact that the catalegitic state in Phasmida arrises insturally, and from unknown inner causes. When in an sorive condition, the insects cannot be hypnotized artificially, as can be done with rabbits, crayfash, etc. For this reason he calls the phenomenon "autocatalegsy." He adds that from a biological standpoint the catalegts attee may be regarded as an accommodation to a highly developed protective resemblance. The insect becomes in no small degree a part of its environment, and completely subject to external factors. It is, for example, awayed by the wind, just as if it were really one of the stems smong which it rests.

In order to awaken these Phasmids from their hypnotic slumber, prolonged excitation of the nervous system is needed. This may be effected mechanically by phothing the extremity of the abdomen with forceps, or by electric shocks from an induction coil. It is noticeable, however, that the stimulus must be very strong with Huntington's Chorea. There were also 10,000 trait surrame eartle in the files. These embled the students of find all the data in the effice on a given trait, classed filed according to surrames (the matten names of martied women are always used when available). There are now 8,650 trait-locality cards. These combio one to locate resultly all the data in the files of the office on mechanical gentluses in Counsecticat, or any town or city in that State, or on feeth-embledness, in Rockland County, New York, and so on There are also 8,650 locality-trait cards, which collection performs, as its name indicates, the function of tracing the bistory of trails possessed by the families of a given locality is a sort of inventory of the blood of the community. Then there are the surrame locality cards, and the locality-surrame cards both numbering 8,150. The first constitutes a directory of the geographical distribution of a given family and the second serves as a directory of family and serves as a directory of the serves as a directory of family and serves as a directory of the serves as a directory of family and serves as a directory of the serves as a directory of family and serves as a directory of the serves as a directory of

On January 22nd, 1913, there were on file in the Eugenics Record Office seventy-seven requests in which intelligent persons asked for instructions for multip study of the eugenical fitness of a contemplated mar-

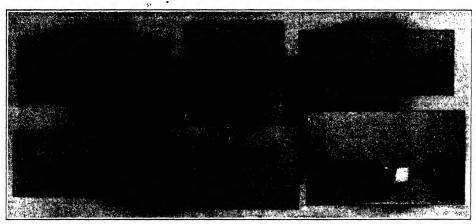


Fig. 1.—Normal resting attitude of the insect Correspond. Fig. 2.—Standing on its bead. Fig. 3.—Attended on its back. Fig. 4.—Nautis, or seahorse like page. Fig. 5.—What Prof. Schmidt called the wrestling "brighes." Body best said supported by small stone. Fig. 6.—Insect as bridge between two books. It is body weighted by means of pager steps.

#### Catalepsy in insects.

siumber, or as due to instinctive promptings calculated to enhance the protective value of the creature's physical endowments—such as its abane and coloration. But Schmidt has demonstrated that the quiescent condition—at least in the case of Corression—its continue or cataleps. All his experiments have shown that the muscles of the insect are in that state which physiologists term foreibilities corne, i. e., war-like flexibility. They are strained, but not extremely so, and if they are further stretched, they remain in the new position. Exactly the same state of the muscles is observed in the case of catalepsy or "hypnosis" in the higher animals and in manifed.

mais, and in mention.

Schmidt found that he was able to arrange the Phesmids, when in a cataloptic state, in uncousts and abuormal poses, and that they would subsequently remain aboutely motionless for long periods of time. For example, he placed some on their bends, and they remained thus for as long as four and a half bourn. Others were polesd bridge-wise between two books, the middle area of the body being weighted by usens of paper align to such an actaot that the whole fasset became how-shaped. Even more remethable was the positive bow-shaped. Even more remethable was the positive bow may be a such as a subsection of the subsection which Schmidt designates the "westling bridge." This, as well as numerous other strange attitudes were ngaintained by the Phasmids for one or more heurs; nor was it possible to delsect the slightest sign of facilities or even of vitellity. Finality, some of the fassets were applicated to the ordered of mutilation; and its was found that they less, attenue and heads naight be out off, and their heddes silved into frequents.

or long continued to be effective. In normal circumstances the insects regain animation at the hour of twilight, probably as the result of stimuli connected with the processes of nutrition, though of this nothing is certainly known.

In conclusion it remains to be said that the remarkable results which have attended Schmidt's experiments should induce many students to underlate, similar investigations. If one species of Phasmid is subject to catalogic settures, then in all probability other species will be found to exhibit like phenomena. Moreover, it may well be found that the protracted periodically sustain are really flustrances of catalogys. This may be the case, for example, with the strangs, attick-like caterylliars of the geometrid moths whose babtic resemble so closely those of the Phasmidt. Again, it has already been shown experimentally that a pin may be passed through the body of a sleeping moth without awakening it. Surely this augment that the insect is not merely reposing, but rather that its fig a outlaptic selum.

#### The Progress of Eugenica

DURING the past twusty-seven mostles more than agency and the past twusty-seven mostles more than agency second there exchanged letters with the Eugenice Second Office of Cold Spring Harbor, N. Y., or matters concerning sonis-spines of sugmined studies. It is a family surfame text cards in the file of the office. These are for use in locating all persons of the same surrance with the same trait—us for example, all the Smiths

riage, all of which letters were received within a space of four months

of four monins of the subject of eugenies has become a popular one for newspaper discussion. Unfortunately the American receiver does not trouble himself to find out the trath concerning the alms and methods of eugenies study. Austing even remotely related to sex highers, infant mortality, forthmarks, budy entitre, sex control, prenalal influences, or to the care, "ene" or treatment of defectives, is given a heading entitled "engenics"—that or that. Some day they will learn that it is only one of the sciences decorded to the promotion of human welfare. Engenies is no more one-ent-und with defertives than with genius. Both are legitimate objects of curent-ent-with greatment of the sciences decorded to the promotion of human of the sciences decorded to the promotion of human one-first that is a task for the chienter that is a task for the chienter—that is not—as one capter recently called it—the latest could implement. If does not propose to undermine the existing social and mortal order, or to undergoine the existing social and mortal order, or to destroy love, but its programment closes and for the intelligent management of defectives.

Fands for the Mawson Expedition are now probably sufficient to complete its work and bring the explorers home, the Commonwealth of Australa having just added 25,000 to its prevous donations. The prese report recently published to the effect that Mawson and his companions had been brought away from Addio Land was erroneous.

#### Motor Roller Skates

ONE of the interesting novelties to be seen at the recent electrical show at the Grand Central Palace, New York, was a pair of motor roller skates, adapted to be driven by electricity obtained from a buttery carried by the wearer of the skutes. The inventor of this machine demonstrated the practicability of the skates by making exhibition runs around the building and also on the sidewalks outside. As shown clearly in the photo-graph, each skate is provided with an extension to the rear, on which is supportextension to the rear, on which is support-ed a small two-pole motor. The armature shaft carries a sprocket pluion, which is connected by chain to a sprocket wheel on the rear roller axle of the skate. The motors may be connected to one or both cells of the battery as desired by means of flexible wiring. Our illustration shows nexible wiring. Our illustration shows the two cells of battery supported by a strap running over the skater's shoulders. However, in the preferred form the bat-tery is strapped to the back of the skater. Current to the motors is controlled by two hutton switches, one for each mot that the skater may conserve his batters by cutting out one or the other skate, de-pending upon which is idle. It will be understood of course that the skater may mercly stand on the skates, setting them be propelled by the motors, or he may skate on them in the ordinary way, using the motors to give him a much greater

#### A Convertible Touring Car Tractor

I N the present sulghtemed age, agricultural rescues are comparatively common and they had early to be still more many the best of the still more than the sulght of the still more distance of the sulght of the su

The car, it may be seen, is an ordinary every day touring car—when the great tractor wheels are left off, of course. The only alteration in it that has been made consists of the addition of a pair of spur gears to the bubs of the driving wheels. see spur gears mesh with much larger gears on the tractor wheels, and with the automobile in "high gear" and a single reduction at the tractor wheels, the speed of the machine is four miles an hour; there is a second speed reduction, for heavier bauling, which gives a maximum speed of only two miles an hour. The whole tractor mechanism is quite separate and distinct from the automobile proper and is merely bolted in place when the er desires to convert his pleasure ve hicle into a working vehicle. the slow rate of progress and the heavy work imposed on the engine, an auxiliary water tank, to insure proper cooling of the cylinders, is carried. A power shaft for stationary work also is provided.

This movel journing our tractor is designed to draw, and actually does draw, three sixteen inch plows in soft or wet ground, and, it has been estimated, replaces from six to nine horses.

#### Protecting Store Windows from the Shock of Blasting

N executing for the new subway runhing mp texination Avenue, New York, a large quantity of rock has had to be binsted. The shock of the dynamite exploitions has worked havoc with plateglass store windows along the line, and the contractors have found it necessary to reinforce the windows. This has been done in a very effective way by the use of wooden supports on each side of the glass, which serve as spreaders for wires that run across the glass to opposite sides of the window frais. The spreaders consist





Electrically driven roller skates.

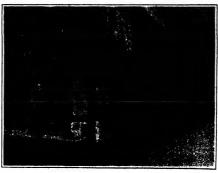
The "egg" in the Giants Causeway.



A motor car converted into a tractor.



A two and one half ton hydro-aeroplane built to fly across the ocean.



Store windows reinforced to protect them from the shock of blasting.

of woodes crosses with a short water appropriate properties from the Interdess of the Congress of the cross is short with a second rubber. Usually four of the woode or rubber, Usually four of the woode crosses are used on a window, but the number and position deposit spins; the size of the pane. When the wires are stretched across, both instée and debeties are stretched across, both instée and debeties into a truss which is greatly strengthesse juite into a truss which is greatly strengthesse against the explosion wave.

#### The "Egg" in the Giants Causeway

MANY of the readers of this artistic Many risited that straings formating in the north of Irainad Ruowa as its Glanta Cansesway, so called en account of a segund that a Sector justor to assess the second of the s

#### An Aero Yacht

A N enormous flying machine has recent-ly been completed at Dutch Island, A by been completed at Dutch Island, near Savannah, Georgia, by Capt. Mat-thew A. Batson, United States Army, re-tired. The construction of the machine occupied seven months, and it cost \$50, 000. It weighs 5,000 pounds, and the inventor of it claims an additional lifting capacity of two tons. The machine is equipped with twelve large wing planes, one pair having a spread of 391/2 feet, and four pair with a spread of 87% feet, while a sixth pair has a spread of 30 feet. The wings are peculiarly designed with the pur-pose of gulding the air currents inwardtoward the body of the machine and ly toward the body or the machine and there banking them under the base portion of the wings, which are concaved under-neath and carried back along the chassis, so that the currents of air are conducted along the parts nearest the chassis. Any wing or set of four wings or all twelve wing or s may have their angle of incidence changed at the will of the pilot by the turn of a wheel while the machine is in full flight The machine is equipped with three Emersun aeroplane engines, of six-cylinder type installed in the floor of the pliot house. Combined, these engines will supply 350 horse-power, driving the propellers at 1,000 revolutions per minute. Any one of the engines may be thrown out of or into ac-tion by the operation of a clutch. The ability the operation of a cuttor. The cabin of the machine is 27 feet long, and is constructed of cypress paneling % of an inch thick, over which is a covering of canvas. The lifeboat is made of three-ply cypress and sale with inter-layers of curvas. The length of the machine is 74 feet and of the heat? canvas. The length of the machine is for feet and of the boat 33 feet. It is by far the most elaborate hydro-aeroplane ever attempted. The inventor expects to fly across the Atlantic in this machin have yet to learn what it will do in flight.

A Mineral Prospecting Appearatus.—
Benjamin Andrews of Houseon, Tema,
has secured a patent No., 1971,196 for a mineral prospecting apparatise which includes a bit and a double drill stem formed of two concentric pipes; air being Torseed down through the cuter said into the inner pipe with the lower said of the frame pipe or the control of the frame pipe of the former pipe open and dispense to remerite the state-state removed by the felt to it can be formed in through the through the transmission of the control of the felt of the felt of the control of the felt of t

Propagation of Appendix.

CAND FRAME FOR CAPP AND HATEformer SECULIANCE SER AND HATEformer SECULIANCE SER ADVANCE. In this and
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made the article caccellancy light, to insure
densities the water, to relations, and to reder the same Seculia Former Seculiance
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We maintain the original shape of the article steps of requiry used.

Sample SHIFELD.—LOUU L. JURY, 900 Crossing in the property of the shape of the shape of the shape of the shape of the sample of the purpose of lamber or replacement and not provided, shaped or replacement and the shape of the purpose of lamber of the purpose of the shape of the

GPN-GRANENT HOLDER FOR HATR.—A. P. BERNER, 28 W. 127th St., New York, N. Y. This device can be easily secured to a but and wift quickly engage any desired ornament, such as facther, ribbon, etc., at any angle, and such ornament can be easily disengaged to adult another when it is defired to use the same hat for a different sectal function, and the secure was a second secure and secu

#### Pertaining to Aviation.

AIRBHIP.—C. R. MTRR. Pranifort, N. Y. The invention relates to sirables and especially to such that employ gas begs for the voy-racy. It contemplates the use of an emplosion congie for proposiling the sirable, and an object in to provide an arrangement whereby the exhaust gases from the eight pass into the gase.

thereof.

AREOFLANR.—H. C. Watta, care of H. C. Wei Motor Co. Inc., 120 World Tower Bide.

110 W. 40th St., New York, N. Y. Thia serve place in the complex place in the complex

#### Blestrical Bevie

Electrical Sevices.

AFPARATUR FOR USE IN THE THEAT.

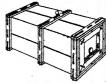
MENT OF DIANNESS.—A. The Baseling of the Victoria of Mr. Rosenberg's application which was patient Ment 26th. 1913. No. 1,007,1719, and has for its object a device form of the Victoria of the Victoria

Of General Interest.

WOODEN PACKING CARE.—B. Desers, 742

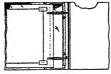
Main St., W. Tampa, Pia. The investion relates to a pecting case for general shippant

purposes, and the state of the state of



ODER PACKING CARE.

BinDar.—C. E. Swirr, 800 Harmon Ave. Danville, ill. This invention has reference to loose lest binders and is especially intended for use to produce a binder adapted to receive loose leaves consisting of cardboard or like



LOOSE LEAF BINDER

mounts bearing blue prints on opposite aides.
The improved binder and mounts has a capacity and form such that a large number of blue prints may be assembled in a single binder and accessible for convenient examination.

accessible for convenient examination.

SANTARY MOLDER FOR BARREIGH.

CHECKE AND ACCESSORIES——. J. Cox.
care of Piones Barler Ring. Dodge City, Kan.
An object here is to provide a holder for the naso of basivers, adapted to hold checks of varying amounts, and in addition, to hold various accessories, and such as trovers, carlers, latter papers, and such materials as styptic powder, carendary and control of the control of t



is raised, will be offset at one aids of the handle, parallel therewith. The jliustration shows no elevation of an unbrella convering this invention, the umbrella covering being emitted, and the tip section being adjusted in a position offset from the handle acciden.

#### Hardware and Tools,

IOCK.—A. S. Faster, S. W. 19th St.,
Manhatan, N. Y. N. T. The invention per
Manhatan, N. Y. N. T. The invention per
Larly to a locking structure, operated by a
magnet The object is to provide a lock which
may be readily operated from the interior at
any time and which may be operated from an
attrior or outside of the door by the magnet

PENCII, SHARPENER...J. J. WOLF, \$36 Nizon St., San Antonio, Tex. This invention prevides for sharpening a penuit point by emoving the wood therefrom in the form of



PENCIF. ANABRANCES

the case. The closes are stranged at each end and intermediate the ends, and the wirse of the case. And the wirse of the case is the case of the case. An additional wife is the case of the case. An additional wife is the case of the case. An additional wife is the case of the case



tors detachably secured upon a head. The various cutters are removable and replaceable independently of one another. In operation independently of one another. In operation shark its connected with the operation mechan-ism of the drill and loint forced against the earth is caused to rotate. The cutters are thus caused to rovolve, the cert being brought into operative engagement with the earth, rock or other material to be cut.

#### Heating and Lighting.

PORTABLE EIRCTHIC REDING LAMP.—
B J Lavi. T. A. Rous, and A. H. Roaz, 88 and
85 Beech Rt., London, B. C. Raginut This
investment of the state of the

like, or in any desired direction.

MEANR FOR CONTROLLING FUMER OR

MMOKE—G. R. WARRONKE, Vacaville, Cal.

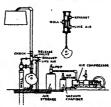
The luvention has reference generally to means
for controlling fumes or amoke, and mare par
tricularly it is adapted for e-operation with
a smetter whereby gas, fumes and amoke

cuitted by the ametter may be controlled.

Etomeshold Willittee,

EGG HEATER—T Hotz, care of the HottLyon (to, Tarrytown, N Y Among the principal objects of the tuvestion are: To provide
means, manually operative, for rotating suitable Buses, to eliminate friction in the operation of the apparatus; to reduce the space required for storage and transportation of the
apparatus; and to simplify the construction
and ecosomics in the cost of the same.

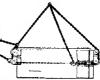
APPARATUR FOR HOISTING LIQUIDS FROM WELLS.—D. D. McCALL, care of South Texas Lember Co., Houston, Tex. This invention relates to apparatus for raising liquid from wells by means of a compressed fall, such as air or other vapors or gax, and refers more particularly to the class comprising a



APPARATUS FOR HOISTING LIQUIDS FROM

member carrying a compressed finid, a member used as a cylinder for the liquid to be hotseld, and the control of the control o

books it could not be a statement of the books of the boo



SELF-CLEANING DRAG SCRAPER BUCKET.

or skips. Among the objects of this invention is to devise a bucket having means assuring a therewith for animatic operation who rely the contents of the bucket, if of a sticky nature, will be dragged or scraped therefrom at the dumping operation

dumping operation CLOCK WINDING DEVICE—C T HERN-MARD, BOS 564 Smilsings, N. C. In the pre-ent patent the object of the improvement is the provision of a rlock winding slower in the form of a self-contained unit attachable in the spindle of the winding barrel of the clock, and bodily removable therefrom whenever de-and bodily removable therefrom whenever de-

Partializing to Vehicles.

DEFLATING DEVICE—W. F.
Stickney, B. D. Evice—W. F.
Stickney, B. D. This device is for use with
the air valves of pneumatic tircs, wherein
means is provided for opening the valve, and
having means in connection therewith for
gripping the threads of the valve casing the
hold the valve open to premit the air to discharge therefore.

charge therefore provided in the de-liberty programment of the de-Boltz Padershiviti—Ranco C. Asigur, 176 Congress R., R. Detroit, Mich. This invention is a bost provided with a lever lock or fasted lag for use in piece of a nat, the same boding adapted for general uses as an ashetitute for adapted for general uses as an ashetitute for applicable for excuring the lows of automobile tops in such manner that they may be very quickly and very easily located securely or detached.

orached.
VEHICLE TIRE—R. L. Laker, P. O. Bot.
18, Hotolitis, Hawaii. This Inventor provides
a casing for a pacumatic tire the surface
whereof is imperious to puterior and I he
body whereof holds the parametric tube against
undow or necessicalised inflation strains; and
povotices a shaple, efficient and revonantial form
of construction.

#### Designs.

DERGON FOR A LAMP SHADE.-I. II NAMI, care of Tilfany Furnaces, Corona, N. Y. N. Y. In this ornamental design for a lamp shade the top and increase are of a band like formation, the material forming the body of the shado being of an naeven yet attractive present design.

Nors.—Copies of any of these patents will be furnished by the Norskyller American for ten cents each. Please state the name of the patants, title of the invention, and date of this paper.

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TECHNICAL

"More Fascinating Than Fiction"

magazine, and yet they are things upon which the future progress of the world is to be found-It covers fully the discoveries of nce, the schievements of inventors, the feats of engirs and explorers, and the opening of every new field of human endeavor.



Just Bet a Copy and See Fifteen Cents Per Copy A Dollar-Fifty Per Year

A New American Flying Bost (Concluded from page 468.) on the Wright biplanes, instead of being

on the Wright hiplanes, material or being mounted on the extension of the hull as in most other flying boats. A special quadrengular tapered float is mounted beneath the boat about haif way between the latter and the end of the plane, on each side on the usual flying boat cylindrical float are piaced at the ends of the lower plane. The seats for the pilot and passengers ar located in the hull just in front of th nai flying boat cylindrical floats ower plane, and a superstructure is fitted giving the hull much the appearance of cruising motor boat. A starting crank is arranged conveniently behind the pilot's arranged conveniently beamt use photo-seat, and the craft is equipped with an electric motor starter, muffler, anchor whistle, and other fittings used on motor

The power plant of this new boat con sists of a 6-cylinder, 60 horse-power Wright aeronautical motor, which drive the twin propellers by the usual crossed chains. So efficient is the flying boat that speed of quite sixty miles an hour ha ed with two people on board; and it rises from the water after traveling a distance of less than two hundred feet. The speed attained with 80 horse-power shows that the machine is more efficient than the usual type of flying boat in which n motor of from 80 to 100 horse-power is generally used. The machine has shown itself to be very stable in winds and to be readily steered and controlled, for Mr. Wright has frequently piloted it above the Miami and Mad rivers, which are nar-row winding streams in the vicinity of

Another point to be noticed about this new flying boat is the location of the seats strike the pilot or passengers, while the otor is well protected behind the latter On account of the high freeboard and thor ough covering of the hull, the boat should be able to live in a comparatively high sea

#### Baalbek the Mysterious

on a raised platform resting on substruon a raised platform resting on anostruc-tions. The Great Temple ites 44½ feet above the ievel of the plain and is the highest part of the antire inclosure, while the Great Court was only 23 feet lower down. An inclosing wall, the mammoth stones of which have been the marvel of engineers for ages, deserves mention. The lower courses of the waii here are built of stones of moderate dimensions, but they grow rapidly in size, until we come to a grow raphiny in size, until we couse hortest being 63 feet and the longest 65 feet in length, each being about 13 feet high and 10 feet thick. The course of which they form part is some 20 feet above the surface of the ground. They are the largest building blocks ever known to have been used by man, and a still larger one lie in the ancient near-by quarry, never hav-ing been detached from the rock beneath This one is 70 feet long, 14 feet high, and 13 feet wide. Its estimated weight is 1,100 tons, and it is calculated that to raise it would require the strength of 60,000 men. It was probably intended to be placed in the cyclopean wall of the temple inclosure, but some sudden war, pestilence, or revolution must have interrupted the plans of these ancient builders or they would not have expended the labo of years upon this mighty block and then abandoned it still unattached from the

albek's third and last ruin is the pretty little Temple of Venus. It is situated some 200 yards from the other rules. It is an exquisite Corinthian building with gracefully decorated interior. Ow ing to the peculiar arrangement of the interior columns, it has the appearance of an octagon. The entablature supported by these columns does not run continuously from column to column, but recedes in a from column to column, but recedes in a graceful curve aimost to the wall of the cells, giving the whole an appearance of lightness and elegance rarely equaled. In the last century some attempts at renovation were made by the Gives Christians, who converted it into a church dedicated to St. Barbara. It is not now, however, used for worship, and has been rapidly

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Libra

#### The Manufacture of Hydrogen Gas (Concluded from page \$52.)

ried off through the opened top cover and emerge into the air through the plate iron chinney. The blast is now stopped and the top cover closed down, whereupon the oil spray is set working, and the oil is transformed into oil gas, this below. off spray is set working, and the off in transformed into oil gas, this being obliged to beas through the heated coke of the two generators in succession. In this way all the light as well as heavy hydrocarbons are decomposed and the result is a high grade of hydrogen gas containing from 90 to 96 per cent pure hydrogen. Before the producer is actually working to deliver the pure gas to the rest of the apparatus care is taken to evacuate the gas which was already contained within the pro rs, and the first part of the newly d hydrogen is allowe way of a special valve which is fitted on for this purpose, according to a patented method. During the usual working of method. During the usual working of the producers, the passage of the game through the hot mass of coke causes the temperature of the coke to become eventually lowered, and when it cools down below a certain point there will be no more gas generated. When this is the case, the oil feed is stopped and the hot air blast again turned on so as to fire up. the coke mass as was done in the first Then the oil spray is turned on and the process repeated. Thus the meth od is an intermittent one, and consists in an alternate operation of the oil spray and hot blast. Firing up the coke by the blast usually takes 2 or 8 minutes during the run, that is, when the coke is still hot, then the gas production lasts for about 20

minutes, and so on.

From the second producer the gas goes
by good-steed piping into a device which
is provided with a water seal (shown in
the first engraving) in order to prevent a back flow of gas during the period when er. Care is taken in all cases to keep the hydrogen from becoming mixed with the hydrogen from becoming mixed with air, as is of course quite essential. The gas then passes into the second car by means of coupled piping. On the front end of the car is mounted a well-designed scrubber which is designed with water flow so as to clear the gas of all mechanical impurities such as ash or soot. The scrubber consists of a plate iron case which is filled up with the washing elements of patented makeup, a water flow being introduced at the top, while the gas comes in at the bottom of the scrubber. Means are provided for effectively dividing up the gas flow in small streams so that it comes into as good contact as pos-sible with the water.

Next the gas comes into a cleaner which works on a dry process shown in the illustration, and it is designed to remove any sulphur compounds contained in the gas. Here the cells of the cleaner are filled up with a suitable compound which acts as a filter for the gas. For some uses of the hydrogen, the purifying process can stop at this point, as the garks as sufficiently pure for many industrial uses as may be seen by the following analysis: CO, 0.0 per cant; O, 0.0; CO, 27; CH, 60; H, 96.0; H, 98.0; W 1.8. The secold or rarely of this gas is cent; O. 0.0; CO. 2.7; CH., 6.0; R. 98.0; N. 1.3. The specific gravity of the gas is about 0.10. For such purposes it is not necessary to free the gas from carbon oxide or nitrogen. Next the gas is freed from moisture by sending it through a sul phuric seid dryer pictured in the small pharms and dryer partired at the shart engraving and mounted after the other two devices upon the car platform. Last comes a heating furnace for removing the earlien, oxide, the furnace being heated by carbon, calde, the furuses being beared by call gas. Then the gas goes to a cooler, which is built concluse with the first mentioned sensibles. Analysis is then as fail town: OB, O, OH, -0.07, OD -0.4 per clear; N = 84.4; N = 1.2. Sp. gt. = 0.097 to (9.00).

Figure up, select 1 to 2 hours, and the

ing but two men. The strektp and either sup where too far off, by a special outfit pro-vided with steel gas bottles. To this end a third car can contain a compressor plant these need not be carried to any very great

## Notes and ( and Queries.

ind will be mailed on request.

(12874) H. H. anker: Would a hody weigh more at the nearth surface sham may 2,000 with more at the nearth surface sham may 2,000 miles from the center than at the surface by Newton's law and the following attenues, which appears in the International Enviropheciat: "It a body is home as concentrated at the center." A. A body has the greatest weight at the surface of the earth. It is weight attended to the center." A. A body has the greatest weight at the surface of the earth. It weight distinishing as it is carried above or above for surface of the earth distinishes he is correct above or above the surface of the surface of the earth distinishes the surface of the earth distinishes the surface of the earth which the lowest hid weight distinishes diseasily as the distance from the center of the surface of the earth earth, which the form of the earth which the surface of the earth earth, which the 5,000 miles from the center of the earth earth, which the surface of the earth earth, which the surface of the earth (12874) H. H. asks: Would a body

spherical shell has no weight. A body at the conter of the sent is in offect in such a position. (12876) C. W. B asks: In a "iccinnos" article in a recent Sanday paper the writer said that if a stratum of air could be carried to the bottom of the cosm the presenter of the water would be no great that it would condense the air will be be the common the said that if a stratum of air could be carried to the bottom of the beavier and more said than the country of the said that it is a stratum was at the cream at all depths. Hence if a stratum was at the bottom, as suggested by that write, it would not be suffered to the stratum was at the bottom, as suggested by that write, it would be carried as the bottom as suggested by that write, it would be common the said that the surface of the count if all side is right? A Water is about 800 times as dense as the air at the surface of the coesal. If all rould be carried to be sufficient of the seas it would be compared to the surface. But it is obviously impossible to carry air down to the bottom of the sea, the to the presenter of the water. The statement which are very large "in fit. What you can prescribe the statement is also very true. You also have an 'Il' in youn. I far were at the bottom of the sea, the hostion of the said the surface of the water of the except of the said the water as it is also very true. You also have an 'Il' in youn. I far were at the bottom of the said the water as of the absorbed, as the water as it is also what. It is said that it is said that it.

gradually disappear. Hoft statements are correct.

(12876) C. C. S. aska: It is said that
the solar constant is about 8 mual calories a
the solar constant is about 8 mual calories a
nuture per equate notes. How may this be
determined 1. The method of determining
the solar constant is very simple in theory and
very difficult in practice. The sain is allowed to
stime upon a metal result, and the rise of tenfor a given time. Probably the bat work in this
like has been done by Dr. C. G. Abbots of the
Astrophylosol Observatory of the Conspicficationals in Washington, D. C., with his silver
difficult probabilismies without one one only/or water.

Glin probabilismies which does not employ water,
difficult probabilismies, which does not employ or ther,
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# SCENTRICANCERICAN

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#### MOLUME CIR. ]

#### NEW YORK, DECEMBER 20, 1913.

PRICE 10 CENTS

#### The Fifth Award of the Scientific American Medal

A T the time when the first award of the Schratture A armen. A media was made, various devices were submitted to the committee, and all the seculors seemed to think that the sea directed the most dangers. The successful launching of lifeboots and the discovery of fire seemed to be the most interesting subjects presented. The terrible meanes of condingration won the victory and the saidle was given to a very meritorious fire detecting device. The pursuity of pipes leading to the various holds and bunkers with an electric operated fan to bring up the first weaths of anosite to the bridge has proved its worth and certified to the judgment of the experts, but the lifeboot and its accessories still remained presumably safe. There was no danger, the wireless would bring all the skips in the lanes to attention when the "8-0-8" siznal was fashed and all would be saved. Halls were subdivided and bulkhed doors were closed from the bridge. The sea was robbod of its terrors.

Nawspapers seemed to think that any exploitation of the lifeboat meant some free advertisement of some freak invention. All went well until there occurred ope of the most cruel and unnecessary accidents in the bistory of the world. A proud ship on her maides trip was wounded and sunk in a short time.

Now at this late date we have all reversed ourselves, and the medal so much esteemed on account of the carmed in its award goes to the company that for yearhas been harping on the fact that an adequate number of lifeboats, successfully launched would aure pusselgers and crew until the arrival of succor summoned by withdeam

The American Moseum of Safety as eustodian from year to year of the Nonzwitzio American and other medials given few various anchievements. Sas seen fit through its committee to award it for the fifth time in seven years to the Weiln Marine Equipment Company of Long Island City, N. Y. for "efficient and dependable" devices for award lit for the award contemplates not only a beautiful mechanical schievement in the way of a quadrant davit to which the survivors of the "Titanic" disaster owe their lives in many cases, but also a precidently unshable lifeboat, a non-top-pling block which does not fall after the boat has reached the water and an indestructible rope withetanding the atmospheric conditions for years. It is the Weiln davit and the Jundin decked lifeboat that make up the principal elements of the award. Of course sufficient lifeboats must be provided for all, event fepried mechanism for lowering and casting off and keeping afont have been provided. Herein was the fallacy of

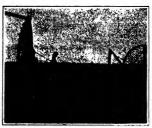
the British Board of Trade rules. The "Titanic" compiled with all the requirements, but look at the result. Now we have lifeboats nested in pairs, athwartships in three or more, stowed on the upper promenade deek



The Scientific American Medal, awarded for the fifth time.

as well as on the boat deck. This is all a step in the right direction.

The Welin davit permits of one or two rows of lifeboats either nested or in tandem being launched from



Swinging out the upper of two nested Lundin boats

either side even with a severe list to port or starboard.
According to this invention the davit turns about a
center moving along guides, and its lower end is in
the form of a toothed quadrant, preferably circular,

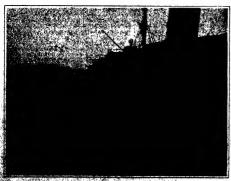
rolling on a rack. The weight of the hoat and its contents tend to make the quadrants roll on the racks, inclining the davits more and more and at the same time moving them outward. The weight of the boat and its live load tend to assist in swinging the boat out over the water. Two sailors can launch a boat containing of prevents the fouling of tackie especially when being raised with no load attached to lower the companion boat.

The Lundin lifeboat was a happy thought which was evolved after the "Italies" disaster. The lifeboat which we liliastrate is as "unstrikable" as a lifeboat cut he made. It is built of steel with cellular bottoms and cannot be smashed, even if a heavy sea crushed it against a huit. The freeboard is bitch, and descenable fonders prevent the staving in of the huit. Folding weather boards a toda out, need to keep out the sea. The boat is divided into eight water-tight compartment by transverse buildheads which earry the deck above the load waterline, thereby unking the boat saif-bailing by means of scappers through the loation of each compartment for imprection and planting. The beats are tested by actually junting sixty men in them and raising them from the ground or over the water. One of the most important exhibits at, the First Internal Expandition of Stefty and Saultation was a pair of Landin lifeboats in operation. There are other accessories such as lowering bolinds, ditting choice, etc., which concern the naval engineer rather than the lay mubile.

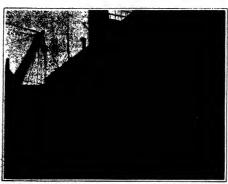
The SCIENTIFIC AMERICAN Medal was awarded on the eresting of becomber 12th, at a banquer given in the great bellroom of the Waldorf-Astoria, New York. Dr. Philey presided. Dr. William H. Tolman, director of the American Museum of Safety, showed interesting sildes of this and other medal-winning devices There were addresses by Dr. Ar. Hadley and Dr. F. R. Hutton, Surgeon-General Stokes and President Arthur Williams.

The other awards were as follows: The Travelers' Insurance Company medals to the "A. E. G." of Rerlin and the New York Telephone Company. The Louis Lidingston Sesman medal to the United States Steel Corporation. The Ratheau medal to the General Electric Company. The Harriman medal was awarded to the Southern Pacific Railway, which was operated for few years without the loss of a single passenger's

Prof. F. R. Hutton made the presentation. The exposition at the Grand Central Palace opened on December 11th with a large attendance, which speaks well for "Safety First." Some of the exhibits will be described and illustrated in a subsequent issue.



The land diff on a markety Disc, thereby the Weltz quadrant davits



Lower deck davits on the "Imperator," an example of good engineering practice.

NEW YORK, SATURDAY, DECEMBER 20, 1913

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The purpose of this journal is to record accurately, simply, and interestingly, the world's progress in soitific knowledge and industrial achievement.

#### The Decline of the United States Navy

HE United States Navy is declining Under the policy of the present administration it is declining at a rate, which, if maintained for the next ing at a care, which, it maintained for the flext four years, will place it in the fifth posttion, below France and Jupan, and will reduce the United States from a first-clines to a second-class naval power. We have on our dock a public document, showing the relative position in sea strength of the United States Nava.

Navy, which is published by the Government at the Navy, which is published by the Government at the close of each year, and is sent out for the information of the taxpayers of this country. The document is headed, "Office of Naval Intelligence, Navy Department," and it is prefaced by the following suntenent: "In order to answer the frequent inquiries of societies and persons throughout the country interested in the maintenance of the navy and its relative strength and importance in comparison with foreign mavies, the following information has been compiled." From its tables we learn that Great British has built and is now build-ing warships of a total tomage of 2,501,201 tons; that Germany is represented by 1,228,208 tons; the United States by 921,844 tons; France by 876,155 tons; and Japan by 702,000 tons

We say that the United States Navy is declining be cause a comparison of this document with those issued from the same office in previous years shows that, whereas two or three years ago the United States Navy stood second in strength, with a decided lend over Germany, and France and Japan were so far behind this country as to be entirely outclassed, conditions are so far changed that to-day the German may is one third more powerful than ours in total tonnage, France is crowding us closely for third position, and in three or four years' time, at the present respective rates of construction, Japan will have a navy equal if not superior to our own.

We make these statements unreservedly; for they are based on cold governmental statistics. Anyone who reads these lines is at liberty to write to the Navy Department and secure copies of this document, and probably of those of the few years preceding.

probably of those of the new years preceding.
The decline of our Navy, however, is more serious—far more serious—than is shown by these mere figures of total tomage. The building by Great Britain of the first dreadhought is few years ago established an entirely new rating of mayal strength. The all-big-gun dreadhought of the future will be the deciding factor in a mixel campaign. More than ever before, the ship and the gun will decide the fight. Our gunners are doing good work in target practice; but the write doing good work in arger practice; out the writer has direct evidence that it is no better than that it some other navies, and not nearly so good as is being done to-day in one particular navy. Therefore, in a future senight the nation that can string out the longest line of dreadmoughts, carrying the greatest number of long-range armor-piercing guns, will win the fight.

liaving this in mind, let us see how we stand. Great Britain to-day has built and is building 42 dread-noughts; Germany, 26; the United States, 12; France, 11; and Japan, 10 drendnoughts.
We commend to the attention of those me

Congress who waste the time of the nation in feelish talk about the sin of building big gues and ships to cars; then, the following indisputable fact, namely, that if, in a comple of years' thus when all these slips are completed, the Justed States Navy should be sent out by this same Congress to meet the dreadnought fact. of Germany in a stand-up fight, it would be doomed, not merely to defeat, but to absolute annihilation! To the small-navy men in Congress, we commend also the consideration tint, if they dispatched our fisct to fight either that of France or Japan, we should prob-ably win, but at a cost of loss in ships and damage to those which remained affect, that would relegate us to the third-rate position occupied by the Russian Navy at the close of the Russo-Japanese war.

at the close of the Russe-Japanese war.

The silly talk about "navab holidays," the "criminal expenditure for battleships," the "combination of warship building frams to promote war scares," to say nothing of the unctuous moralizing of the editorial writer who cemes late to his deck and is hard up for a subject—all of this and much more is due to a total misunder—all of this and much more is due to a total misunder standing of the purposes of a national war fleet. The money put into a country's navy is spent for national insurance. To preserve the peace, prosperity and honor of the United States, we are at present investing about e and a quarter per cent only of the national wealth of this country in our Navy. Is that a wicked extravagance?

The present deplorable decadence dates from the time, two or three years ago, when Congress refused to continue the policy of building two istitieships a year—an addition which our Naval Board had decided was large enough to maintain the navy at a strength sufficient to meet its responsibilities. sumetent to need its responsibilities. In two succes-sive years, Congress so far lost sight of its proper func-tion as to play fast-and-loose with this recommenda-tion of its naval experts and cut the appropriation from two battleships to one, although making no corresponding reduction in appropriations for auxiliary ships

We had hoved that the new Secretary of the Navy. whose work as the Editor of a paper should, at least, have developed in him the halilt of taking a broad point of view ou all subjects, and especially on those of a national character, would have loyally followed the policy and adopted the attitude of his able predece and bent his whole energy to restoring the material strength of our navy to that standard which the Naval Board had so wisely advised. This he has failed to do; and in his recent recommendations to Congress, indo; and in an recent recommendations to Cangress, in-stead of asking for the four battleships decided upon as necessary by the Navai Board to repair the deficien-cies of the two previous years, he is asking for two only. Mr. Daniels lacks a true perspective and a proper sen of proportion. We wish that his elequence on hebalf of his pet idea, good as it is, of making our warships more than ever schools of training for young men, had been directed to hammering into the heads of Congressien the really hig facts of the naval situation as we have outlined them above

It has been the privilege of the writ r to live aboard ship for extended periods and get into quite intimate touch with the soumen and marines. He found them to be a remarkably intelligent and well educated class of young men, who, while they fully appreciated the opportunities for instruction (now afforded and prosed to be extended) offered by enlistment, were far more interested in the question of the hitting power of their particular ship and the ability of the fleet as a whole to "whip" any equal fleet to which it might be opposed.

The Scientific American is heartily in favor of everything the Secretary can do within reason to render the life of the entisted man attractive and uplifting, the life of the emission and attractive and updating, but we cannot but feel that in the promotion of this particular object, Mr Daniels is losing sight of the larger things, and failing in that broad information and statesmanlike point of view, which should be the indispensable characteristics of the head of this great iustitution

#### The Scientific American in Our Schools

ROM its very first number, published nearly seventy years ago, down to the very last, the Supervising years ago, down to the very man, one Supervision and, we hope, a distinct educa-tional force in this country. As a scientific newspaper it has endeavored to set forth simply and accurately the achievements of technically informed men, the world over. So rapid is the march of science, engineering, and industry that the textbook of to-day is all but and industry max the textbook of fo-day is all pur obsolete to-morrow, and so enormous is the amount of unterial presented to learned societies for considera-tion, that even university lecturers find it difficult to keep abreast of the advances made in their own special field. Only a popularly worded periodical, which can held. Only a popularly worden periodical, which exists for the sole purpose of digesting the results of scientific investigation and of presenting them in such form that the layman may read them understandingly can really supplement the class textbook. In the course of time the Scientific American has become, as a result, something more than a journal to be read during of time the "CCRETIFIC AMERICAN has necessarily assult, something more than a journal to be read during an idle hour. It has become in truth a kind of popular illustrated weekly, encyclopedia of zechnology, and as such it is treasured in perannect bound form not only in the fibraries of the more important schools and universities in America and E a general interest in scien

a general interest in science. We are impelled to make these observations and of the extensive aditoral concentrations. While not contest "What say the Ten Greatest between those of our Tuner" was in progress. To be make knew that many a young sane, has received the accurate impression of the wax world of thoughty the pages of the Schmatterio American, and that is a boy with a natural bent toward science or sugit a boy with a natural bent toward setons of suggested ing was encouraged by its pages in ellipsing to dis-belled that among the ranks of professional engineers, physicists or chemists, he could accomplish its life most successfully. But we did not know, as the estri-spondence revealed, how very extensively the Scrustrysia August 18 amplious the trackers to this state account AMERICAN is employed by teachers in their class rooms.
One instructor made the articles in the journal the subject of weekly essays to be written by his pupils; another used it to illustrate lectures; a third '(and it seems that there are many like him) selected the more important articles as they appeared from week to week for class room discussion. The subject of the contest what are the Ten Greatest Inventions of Our Time?"
ient itself peculiarly well to class room work. No two
thinking human beings are quite in accord on the enpracetest inventions of our time. Veritable debutes apparently ensued in many schools throughout the country, if we may judge by the votes of pupils on the subjetaken by school teachers.

The gratifying interest, which was shown in the con-test leads us to ask school teachers if the SCHENTIFIC AMERICAN cannot be made even more effective for school use than it is at present. While the point of view of an editor—particularly the editor of a popular scien-tific journal—is not unlike that of a teacher in many respects, nevertheless the suggestions of teachers abould prove highly illuminating. The Editor of the Schri-TIFIC AMERICAN would therefore appreciate it if those American more or less regularly in their work would et down their thoughts on the subject and send th

E think of Napoleon as the great Lord of War, the butcher of human live War, the butcher of human lives, the build-er of a great empire, built only to fail even, before the death of its founder.

before the death of the foundation. It is well to remember that his genius was great in also other, more hatingly fruitful fields. He was not only a great warrior, but also a great statesmen—and as such he did not full to resilise the importance to the community of arts and sciences

Writing to the astronomer, Oriani, from Milan, which

he had entered in triumph, Napoleon said:
"The sciences which do honor to the human mind and the arts which embellish life and perpetuate great achievements for posterity, should be especially honored

under free governments. . . . I invite the scholars to meet and to give me their opinious as to the means that should be taken, and the needs to be fulfilled, in order to bring new life and activity into the sciences and the fine arts.

are ann activity into the sciences and the nine arts. Those who wish to go to France will be received with distinction by the government. The French people set a higher value on the acquisition of a skilled mathe-matician, a celebrated painter or a distinguished man of any profession, than upon the possession of the largest and richest city."

A Remarkable Aerial Cableway, about 75 miles long, is soon to be built across the mountain barriers separating the famous Vale of Kashmir, in the Indian native State of Kashmir, from the plains of the Punjab. It will be by far the longest cableway in the world, says a consular report on this subject the longest at present being one of twenty-two miles in Argentina. The plan of constructions of the plan of contractions and the same of the plan of to the off control of the control of the control of construction an ordinely' railway late Kashudr has been pronounced impracticable on account of the lease congionerate nature of the soll in this part of the Hensilaysa, which causes insumerable slipe and the fights of huge boulders with every heavy rain. The previous carriage road into Kashudr, extending short 300, sales between Ravalphald and Stangar, was east be suit, with the greatest difficulty, and with match least of the description of the country of the control of the country of the of constructing an ordinary railway into Kashmir

A Section of the second of

#### Bugineering

Especimental Fragores Trislan—The Great Western Balless Company has put in service two experimental, rhospecto trains, each consisting of four care. The care are built suitedly of setod, and they are lighted throughout electrically. Wood has been practically eliminated from these basins. The only wooden construction is the foot-board on the outside,

Railway Accelerate in Assertica.—During the first quarter of 1913, 195 persons were killed and 2,025 were injured in train accelerate. In other than train accelerate, including accidents to employees and to peasangers and treepassors, 2,098 were killed, and 17,194 were injured. Industrial accidents on railroads, not involved in train operations, accounted for 57 killed and 36,812 injured.

and 28,812 injured.

Marinase as Englasmen and Trainmen.—Under instructions from the War Department, marines from
the marine barracies, Camp Elilott, I. C. Z., Panama,
are plying to and fro on the regular passenger train
engines of the Panama Railroad, armed with letter
requesting engineers to give them all possible instructions relative to engine running, etc. This movement
is being inaugurated for the purpose of having men
in the marine service who can be promptly put in on
railways in an enemy's territory to handle motive
power and trains for the transportation of troops and
provisions.

The Great Ealway Tunnels of the World—The world's greatest tunnels are to be found in Europe and a brief summary of these in the Engineer shows that the greatest is the Simplon which is 12½ miles in length. The, the St. Gothard and Lotscheng, are over 9½ miles in length. The Mont Cenis is a little over 7 miles in length. The Aribers, in Austria, is 5½ miles long. There are four tunnels between five and five miles and six miles in length, five one where four and five miles in length, seven between the and four miles, and six miles in the second tree and four miles, and sixteen tunnels that are over two miles long. The longest tunnel in this country, the Hoosac, is four and one third miles long.

Land-seasuse Rairead Cara.—Few improvements of late years affecting the on vendence of the railway passenger are more important than the innovation now being made by the Pennsylvania Railroad in runing between New York and Philadelphia a steel lunch-counter car. All travelers between big cities on important fast train can bear testimony to the innovaecience of waiting for a seat in the dining car. The lunch-counter car will be a greet saver of time, and well obviate much inconvenience and irritation. It is 30 feet long and has a mahogany counter running half its length. Twenty-one persons can be seated, and the counter has every convenience, even to a cigar hundder.

has every convenience, even to a cigar humidor. Sebway Line for Mina.—The principal cities of Italy are considering the matter of installing subway lines in order to handle the ever-increasing traffic. We have mentioned the recent project for a subway of some length at Naplas, and it is now stated that he city of Mina is considering the feasibility of running a subway line. The municipality appears to be in favor of the new scheme, especially because in the inner part of town there are many narrow streets which hinder the proper extension of surface traction lines. One drawback toward carrying out the engineering work on the tunnel is that the subsoil is not of a very good character for this kind of an enterprise, so that some special measures will probably need to be taken.

Giant Coffer-dam for the Equitable Building.—A vast reinforced concrete monolithic foundation is being built entirely account the area upon which will be erected the new Equitable Building in this city, a structural which will contain one million equare frest of restable floor space, and will tower slott to a height of thirtysix stories. The coffer-dam will be a solid concrete wall, six feet broad and nighty feet deep, extending cighty feet to sold rock. This will be the largest office building yet constructed. It will weigh over 200,000 tons as against the weight of 100,000 tons of the Woolworth Building, 185,500 tons of the Municipal Building, and 52,550 tons of the Singer Building. The steel framework alone will weigh 50,000 tons, as against 25, 000 tons required for the Woolworth Building.

000 tons required for the Woolworth Building.

The Meet Powerful Electric LocessedVess.—The New York Centest Railroad is having built for its terminal electric service six electric locomotives which will be espable of developing 2,000 horse-power continuously or 2,000 horse-power or one hour. They will be espable of developing 2,000 horse-power outsinously or 2,000 horse-power or one hour. They quit less transitionally or 2,000 horse-power on this per hour as the one-hour rating. Each locomotive can haul, if necessary, a 1,000-ton train on level teach, continuously, at 90 miles per hour. They are insulated for 1,200 wells to espain the future, should it be desired, to openie out this votage. They are being built by the Quessel Electric Company at Schenectady. They have a higher efficiency than any other high-speed electric locometers yet constructed.

A STANSON

#### Galamas

The Next International Geological Congress will meet in Brussels in 1917.

The 1914 Meeting of the American Association for the Advancement of Selecton—The American Association for the Advancement of Seionce will hold its next convocation week meeting in Atlanta, (a., from December 20th, 1913, to January 3rd, 1914, under the presidency of Dr. Edmund Beccher Wilson, of Columbia University.

C. Francis Jenkins a wasted the John Scott Medal.— The Franklin Institute of Philiadelphis has just amnounced the ward of the John Scott model to C. Francis to C. Francis and the John Scott model to C. Francis in model of the John Scott model to C. Francis Institute to M. Fodicis for original research in this set, the first being an award of the Bliott Cresson gold model 1885) for the discovery of a uncoestril method for projecting motion plotares on a large canwa; which subsequently made possible the thousands of thesiers in which photo plays are produced. Much of his old experimental apparatus was acquired by the National Museum some years ago, and is now on exhibition in the Grafte Arts Section.

Standard Adopted for Weighing Precious Stones—Incident and includer recently issued by the Bureau of Standard, Department of Commerce, announcement is made of the recognition by the Bureau after July 1st, 1913, of the metric caract of 200 milligrammes as the standard of the precious stones, and the standard of weight for diamonds, the staide above all upon which there should be the best agreement as to the unit of weight for diamonds, the staide above all upon which there should be the best agreement as to the unit of weight for diamonds, the staide above all upon which there should be the best agreement as to the unit of weight for diamonds, the staide above all upon which there should be the best agreement as to the unit of weight because of the great value of the commodity. Recently the movement for uniformity in the standard rapidly gained ground, and Spain, Italy, Bulgaris, Deumark, Norway, Japan, Portugal, Roumanis, Switzerland, Sweden, France, Germany, Holland, and Bolgium, with the United States, are in the list of those countries which now use the new international standard. England is the only country of importance in which the change has not as yet been made, but quanderable progress toward that end has been made even in that country.

The American Women's Table.—The Naples Table Association for Promoting Laboratory Research by Women was founded in 1818. It maintains a research table at the Zoological Station at Naples for qualified women students and since 1853 has offered every two years a research prize of \$1,000. The Zoological Station at Naples was opened by Prof. Anton Dohra in 1872 for the collection and study of biological material. It has developed into an international institution offering opportunities for independent research in general biology and physiology. Dr. Reinhard Dohra is the present director. The station provides all material free of cost and the American Women's Table is sometimes used by four or five research students in the course of a year. The Ellen Richards Research Prize of \$1,000 is offered periodically for the best scientific thesis, written by a woman, embodying new observations and new conclusions based on independent laboratory research in biological (including psychological), chemical, or physical science. The seventh Ellen Richards Prize of \$1,000 for the best thesis written by a woman, on a scientific subscience. The seventh comman, on a scientific subscience in independent processing and new conclusions based on independent prize of \$1,000 for the best thesis written by a woman, on a scientific subscience. The seventh Ellen Richards Prize of \$1,000 for the best thesis written by a woman, on a scientific subscience. The seventh Ellen Richards Prize of \$1,000 for the best thesis written by a woman, on a scientific subscience. The three of offered in competition are to be presented to the executive committee of the association and must be in the hands of the committee of the sacrostation and must be in the hands of the chairms of the committee on the prize, Dr. Lillias Weish, Goucher College, Ballimore, Md. before February 26th, 1915. The title page of each manuscript must bear an assumed name; and the writer must send with her amanuscript as selled envelope containing, her application blank and superevente

#### Automobile

A Novel License Tag.—An automobile tag, the body of which has a particular color indicating units of one thousand or more and upon which a number is produced indicating units of nine hundred and ninetynice or less, has been patented by Abram Wakeman of New York city, patent No. 1,073,004.

An Automobile Funeral Car.—In a patent, No. 1,772,844, Ida Schmidt Marvin of Detroit, Mich., presents a fineral car in which a compartment to receive a easket is located in rear of the space for the chafficur and a large compartment is provided in the rear of the casket space for passengers.

A Convertible Automobile Body.—Patent No. 1,072,—394 has been issued to Frank E Plummer of Washington, D. C., assigner of George C, Plummer of the same place, for an automobile body and presents in consection with a fixed front sead, a rear section having a removable seat and conventional sides and done and sildable on the chaosis to telescope the front seat, so that the body may be converted from a road-ster into a delivery or tourning can.

A Simple The Tube Tester.—The patient No. 1.071,—128, to Dover Stamping and Manufacturing Company of Portland, Manne, assignor of Horace E. Wilatuey of Cambridge, Mass, shows a tube tester whose tank has its bottom curved in vertical plane and a rod adjustably someted to the tank extends upwardly and has its upper end bent to form a hook on which the tuber may be suspensed and along which it may be moved in moving the lower part of the tube through the water in the testing tank.

Good Roads, Electric Lighting and the Contral and properly equipped they should be provided with and properly equipped they should be provided with detertive lighting, to enable them to be safely traversed by light as well as by day, and when the electric wring for legiting purposes is installed, it will bring with it to the property of the contract of the property of the property of the contract of the property of the contract that provided during the non-post period of the day would simplify very maternally the financial element in the equipment of the road with electricity, and, when combined with the ultimate business of supplying residents along the route with light and power, should load to a most extended development of the electrical industry. It must be renembered that although the kinematograph was well known for many years, the immensusions of the property of the provision and distribution of suitable films was provided. In like manner the real development of any systematic roadside equipment of the approximation and continuous of a systematic roadside equipment of charged and standardized exchangeable batteries, so that an immediate supply of current can be obtained as readily and as cheapyly as a few gallines of gasoline. When such a field for business appears before the electrical development muduatries, it would seem as fit its exploitation would depend only upon the time required for the construction and installation of the equipment.

Why Not Interchangeable Storage Batteries for Automobiles? - The relations between the unprevenent of highways and the extended mee of unchanically-propelled velories are very generally understood, but it is possible that the influence of the good-roads invesement upon the development of the electric automobile is not so definitely perceived. Already the increasing cost of gasoline is narrowing the gap between the operative cost of the two kinds of motive power, and it is possible that improvements in the efficiency and consense of the two kinds of motive power, and it is possible that improvements in the efficiency and consense of the two kinds of motive power, and it is possible that improvements in the efficiency and consense of the two types of unchange to be fully realized. The owner of a supply of electric current for vehicles which needs automobile are to be fully realized. The owner of a submobile are to be fully realized. The owner of a submobile are to be fully realized. The owner of a submobile are to be fully realized. The owner of a submobile are to be fully realized. The owner of an automobile are two two fully realized in the production of the control of the

## Inspecting Track Scales for the United States Government

#### New Test Car and Equipment of the National Bureau of Standards

By Herbert T. Wade

THE United States Government, through its Bureau of Standards of the Department of Commerce, recently has put into service a special standard testweight car designed especially for testing the track scales on railways and the weighing equipment of grain elevators and other establishments where com-modities are weighed in bulk for the benefit of the general public, which unlike the great corporation is rarely eral punic, which unine the great corporation is rarely able to protect itself by official tests of the scales or weighing mechanism on whose indicated weight they pay freight or purchase commodities in bulk. This test car differs from those customarily employed on American rallways in that the test weights are more carefully standardized and are used with a test tru only when the scales are under examination, instead of truck, car and weights together forming the test weight. This has involved a special form of construcweight. This has involved a special form of construc-tion and equipment which was especially designed for the Government after general plans by L. A. Fischer, chief of the Division of Weights and Measures, and C. A. Briggs, assistant physicist in charge of the car, by A. H. Emery of Glenbrook, Conn., well known as the designer and builder of the famous Emery testing machine of the Bureau of Standards.

The test car, which was built by the American Car and Foundry Company at Wilmington, Del., and then

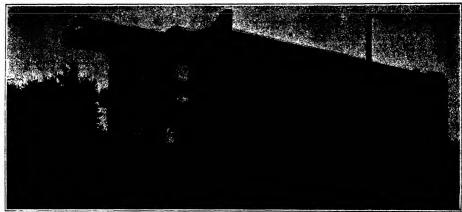
The principal feature of the equipment are the test weights, which are special castings of selected iron whose weight has been ascertained with high precision. These include eight 10,000-pound weights and four 2,500pound weights, large blocks or slabs of iron which when the car is in motion are held rigid, boited firmly to a framework. There are also cases carrying an aggregate of 10,000 pounds in 50-pound weights to be use on, stock yard, grain elevator or other scales, the car carrying a comp ing, examining and sealing all of the various types of scales and their weights of large capacity.

The standard weights and also the cases of separate weights are fitted with a special recess or socket which a coupling connected with the cable of the o head holst can be inserted and the weights raised by the tackle with safety and expedition. These weights were standardized by first securing a series of 50-nound were used to derive a series of correct 50-pound weights. were then calibrated, and these in turn were che against each other and were used to standardize the 10,000-pound weights, so that when finally adjusted, correct on an average to one tenth of a pound in 10,000, they showed that the 90,000 pounds of large weights

geer from motor to axie the track can be moved the track and take any position desired along the scale or the adjoining rail.

This truck, which has a wheelb 5,000 pounds and can be used as a test weight it on the scales over the various sections to be read then the standard weights are added and the and its load is placed again on the scale and the of the truck subtracted rous has resonant, or, sur It is not even necessary to me the truck, for their and weights could be deposited directly on the scales, but the truck is most convenient as truck, are usually tested by placing the standard weights each of the various sections or bearing goings a sively and noting the variation in reading

The functions of the test weight car are considerably more extended than the ordinary test weight cars of the conditions under which it is operat car furnishes properly authenticated weights of large denominations, hitherto lacking, which serve as stand-ards to standardize other large weights by direct com-It affords opportunity to test th of large capacity scales and weighing machinery us in commerce and industry, by direct application of



Inspecting track scales for the United States Government

equipped by Mr Emery is unique in many respects In appearance it resembles an ordinary automobile car, on which, in fact, it was patterned, being of first-class non-collapsible construction, with United States stand-ard equipment. It cost the Government \$14,000 complete, the testing equipment representing a much greater expense than the car itself, and with its various appliances it is really a most thoroughly worked out mechanical laboratory for the purpose intended. equipment the car weighed complete on the scales 172. at Bridgeport

It is rated at a capacity of 100,000 pounds according to railway standards and has an inside length of 40 feet 5 inches, an inside width of 8 feet 10 inches, an inside height of 9 feet 1 lnch, a height at caves of 12 feet 10 inches, and a width at eaves of 9 feet 2 inch a coupler shank 5 by 7, yoke attachment, K2 triple-brake valve, No. 2 metal beam, and Westinghouse draft

The interior of the car is divided into two ments. One where the standard weights and truck for their carrying as well as the crane for handling them are located and a smaller compartment in which are installed a gasoline driven electric generator of 10 kilo watts capacity supplying power for an overhead host, for the truck carrying the standard weights on the scales, and current for the lighting circuit of the car. being also a small storage battery for this last see when the generator is not running. It further amodations for the inspector and his two

re correct within an error of one nound or one mert ance for the highest class of standard weights tested

The hoist by which these weights are handled is the leading mechanical feature of the car. girders from which the crane operates is carried just under the roof of the car by special arches in its fram-Normally this is stowed entirely within the car, but when a test is to be made the large doors at th they overhang the end of the car sufficiently to enable the track to be lifted out from its position within the car and the various weights as desired to be placed upon it according to the test amount desired

e hoist, of course, travels along the overhead rails, picks up truck or weight and transports it out above the track, where the load may be set in position, the power being supplied from the generator and the When it is realized that weights of 10,000 pounds mus be handled safely and speedily the care with which the overhead crane was designed is apparent, for the entire series is loaded or unloaded on the truck well within

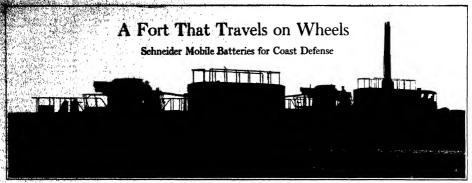
The truck, which also is carried within the car, bolt ed rigid to a wooden framework when not in use, is a six-wheel carriage designed to carry the test weights. It has a 5 horse-power electric motor, which can be supplied with current from the generator through a portable, flexible conductor and by means of a worm and

ndard weights. It also enables the mi d in establishing the weights of the test cars of the various railroads to be accurately standardised, and an examination to be made of track and other large scales as they are maintained by tests either simul

With the new car the Government officials hope to determine the equipment and tests required properly to test, adjust and maintain large scales, as well as study chanical action of the scales in relation the mechanical action of the scales in relation to their proper design and chargeter, and especially as regards their rating, for it is believed that the numerical rating of many scales is far in excess of their actual capacity. It is further the intention of the Bureau of Standards to study the question of scale specifications for the proper design and purchase of scales by the Go and private individuals and to study weig and conditions in general with a view to the and continuous in general with a view to the e tion of those factors which are condactly to me and bad weighing practices. Finally to determine variations are to be expected with the different modifies and to secure statistics and other into for the determination of proper telerances in

and weighing. With these ends in view the Buyeses of Simular car has just made its initial trip though New Jones and proliminary, results have made the highest had sequisition by the Government. There has many general overshalling of trends weights the this travels the importance of the medical that there have been provided in the contract of the medical that the provided that the contract of the medical that the provided that the contract of the medical that the provided that the contract of the medical that the provided that the contract of the medical that the contract of the medical that the contract of the con

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#### THE COMPLETE SCHNEIDER COAST DEFENSE TRAIN AS BATTERY

M OBILES batteries running on rails are well quali-dent if posethle to do away with batteries which it would be otherwise necessary to provide for the efficace of areas included between the principal defensive forti-cations. By reason of their great mobility, these bet-

cations. By reason of their great mobility, these batteries can be rapidly moved to points where it is necessary to reinforce the defense, to enter immediately into action, or to withdraw, either because they may be required deswhere or to escape a well-directed free. The temporary consolidation of a certain number of gues will constitute a kind of movable fort, powerful and very economical. The mobility of the betteries will be a protecting element far more effections than the remparts of permanent forts, upon which, because of the advanced testition of the outworks that five of me the reimpers of permanent inits, upon which, because of the advanced position of the outworks, the fire of an enemy can be concentrated. In addition to these various advantages, mobile bat-teries juivenit other merits, the principal ones of which

fixed coast batteries of the same offensive power, but of much more coatly construcpower, but of much more courty construc-tion, there is great occusiony in the prep-aration of the defense. It is necessary merely to provide a rativary. (a) Complete servey of the plan of defense, since the plantag of a battery in

position is not betrayed by prelim

(c) A better utilisation and economy of material, since the guns will not be use-lessly stationed in fixed positions in per-manent work.

(s) The material can be more easily kapt in condition; for in time of peace the batteries can be stored under cover and

red from intemperate weather. (e) It will be unnecessary to establish strategic roads for conveying stege or field artillery material on wheels.

(f) The railway can be employed for (7) The rainway can be employed nor other purposes than those of the artillery. Thus in time of war it can be used for the rapid transportation of infantry and the conveying of the necessary ammunition to the defending batteries; and in time of peace for the economical development of the coast by the transportation of merchandise and passengers. The system herewith illustrated has been de veloped by Schneider

& Co., the well known makers of armor and guns.

The Battery.— The mobile buttery consists of two massive steel cars, each carry rapid-fire gun, an and an observa constituting a ing an 8-inch ammunition car, tion car, the whoice train of four cars drawn by a loco nary railway. The motive on an ordigun car is provided with two bogie steel platform, low trucks and a sheeter in the middle than at the ends in which lower part the 8-inch piece is carried on mount. The gun are similar to coast-defense a central awiveland its carriage by Schneider. The the frame, and the of the car,



Observation car with fire-control officer at the top of tele telephone connection.

brakes are all similar to the corresponding parts on the ammunition car.

The observatory consists of two morable tubes, tric-

scoring one within the other and of a short fixed sec-

tion of tube carried on the car itself, and extending down to the frame. The fixed tube section serves to guide the movable sections. The movable tubes are telescoped into the fixed tubes when the train is traveling to its destination. The smaller movable tube has an observation piatform at its upper end. The tower is operated by means of a hand-operated hoisting apparalus within the car.

The gru has a caliber of 8 inches. Weight of projectile is 220 pounds; initial velocity, 1,400 foot-seconds; total length of the gun barrel, 11 feet, maximum elevation, 60 degrees; maximum depression minus tive degrees, are of fire, 360 degrees; weight of the gun without breech blocks, 3,560 kilogrammes; weight of the breech block is 140 kilogrammes; weight of the entire gun mounting and car, 1,145 kilogrammes. hydrantic recoil brake is so constructed that the recoil can be readily taken up by the truck and the rails of the track. The mechanism for returning the gun to battery is sufficiently powerful to bring the piece into position, even when the gun is trained at the maximum

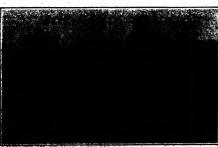
angle of fire. The side members of the platform carry two articulated swinging supports, the outer ends of which carry screw-adjusted base plates, which are employed when the gun is swung around with its longitudinal axis at right angles to the iength of the car Ammanition is served to the gan by means of a small carriage, which runs on a circular rall surrounding

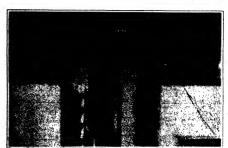
The Ammunition Car.—The ammunition cur is placed between the two gun cars in the train, so as to supply both pleces with projectiles The projectiles are slored in racks arranged within the car in a horizontal position The car is armored with plates one luch in thickness.

The Observation Car.-The observation car is usually coupled directly to the loco-motive. From this position the commanding officer can place his guns in the most favorable positions, or to select a more advantageous

point of observation

The observatory at full extension provides an excellent platform for spotting the fall of the shots.





Interior of ammunition car: crane picking up shell from the shell rack.

A THE PROPERTY OF THE PARTY OF

ONE of the most puzzling problems in physics for the layman is the climbing ability of an seroplane. Nor do daily papers—or aeronautical magazines, at that —ever explain just why it was so difficult for Mr. X to fly the hundred feet higher than Mr. Y, for which they praise him so freely.

they irraise him so treety.

Throwing some light on this question means, incidentally, elucidating some of the dark corners of the whole vexed problem of flight, which, after ten years oplaning, does not yet seem to be understood as well as it should be.

Credit is due to the aviator who breaks an altitude record on two grounds: First, that he has the skill instinctively to fly his machine under the most favorcal conditions and to "get out all there is in shle physical conditions and to "get out all there is in it"—In other words, always to choose at angle of his planes that wastes least power. Not many people realize how much superfluous power and fuel may be uselessly expended in flying; for it would take com-plicated calculations theoretically to define the most economical angle of the planes under varying condi-tions of air and wind, and for a given type and condi-tion of machine and motor. It is an important element of the maket and moore. At some important extraction of the maket angle is best at a given moment, and, incidentally, how he must move his rudders and controls dentally, how he must move his rudders and controls that they, too, uttack the air at the most economical angle. In the birdlike nerophase of the future, with "feathering" propeller blades, it will be still more important to schap the angle of the propeller blades to

changing conditions.

The second schievement for which credit is due to the pilot is purely humau-to have retained full comthe phot is purely numau—to mave retained run com-mand over high faculties under the intense discomforts of very high fights. With many phots those include something closely akin to dizzluess; but all suffer from the Arctic cold and the rar-fled air, though this could

be eliminated by heating and oxygen.

But why is it so difficult for the instrument, the
machine, to fly high? Simply because it is so difficult macune, to ny night Simply because it is so difficult to fly at all, because the air is so thin and light. If it were as thick and heavy as water, we would need no wings and motors, we could swim in it with our mare legs and urms. But because it is thin, we need large wings—to get hold of much at a time—and we need strong motors, because such wings are so difficult to make light and strong, and must be supported by wires and struts, that it takes great power to move all these encumbrances speedily through the air.
And speedily driven they must be, because otherwise
the wings would have to be of a size wholly impracticable

Now if the air becomes twice as thin and light at a certain allitude, all these difficulties of flying become exactly doubled. To fly with the same power at au altitude where the weight of the air is only half as great would render it necessary that the area of the pro-peller bindes of the supporting planes, and last, though not least, of the rudders and controls, be exactly doubled without either increasing their weight or the thick ness and number of the wires and struts necessary to support them Obviously, we cannot do this; and it follows, therefore, that any ordinary seroplane becomes a "racing machine" with "abnormally reduced" wing area, as soon as we mentally place it in such thin air. In short, it behaves as though we had halved the area of its wings, its propeller blades and its con trols, without increasing its motive power, and now wanted to fly it near the ground. If the machine has been designed, let us say, with so much surplus lift near the ground for extra passengers and great stores of fuel, that it can still fly with one man and little fuel after having all its surfaces reduced one baif, it is certaln that it can climb in its normal condition, and with one man, to an aititude where the density of the air is half that at the ground | Incidentally, it there becomes a racing machine—its speed is just as much increased as it would be at the ground, if the wings were reduced to half their size. But not fully, because racing machines for good reasons are not in the habit of reducing the area of their propeller blades as well. the large blade area and relatively small wing area which made the "Baby Wrights" at Belmont Park in 1910 look more like "helicopters stood on edge" than

Thus far we have not considered the "aititude troubles" of the motors, because these are more of an "aerostatic than an aerodynamic nature". To preserve the same power in the motor with the sir's density re duced one half, would also require doubling the cylli volume, other conditions, such as the quantity of fuel for each stroke, being equal. In the same size of cylinder, only half as much fuel can be consumed per stroke at such great altitudes as at the level of the ground. But carbureters in which the amount of fuel per stroke depends on the energy (and, consequently, density) of an air jet, regulate this proportion more or less automatically.

## SCIENTIFIC AMERICAN

There is still another way to look at the physics of high flying, though not quite as efficient in guarding against contained and copilaties: the litt of an accepiane is always a fixed ratio to the pull of the propeller, or the drift. If the sir's density is one ball, the propeller must run much faster to get the same pull; for, in the propeller the pull is likewise a fixed ratio of the "drift." of the blades, or the turning effort of hemotor. This shows at once how a propeller must recessarily race at great altitudes, and why Garross broke a connecting rod while making a new height record. But why would a larger propeller nust cause of the sophlems to which, for instance, some critics of Frod. A. G. Reli have failer witch, when he suggested racing from America to Europe at the height of several milesquite an absurd proposition. It does help, antely; a large propeller is always good, as the Wrights have demonstrated for all time. The writer expects larger propellers with bindes feathering at will during flight (and reversed in safe leadings). Enlarger rodders, There is still another way to look at the physics of properties with bindes returning as will during high (and reversed in safe landings). Enlarged rudders, whose usefulness has been so well demonstrated by Prgoud, and the angle of the planes adjustable against the fuselage or body (or rather the line of the pro-peller's pull), as tried by Gallaudet for a short start en increases of lift, may become standard feat nd sud and sudden increases of int, may become standard rear-ures of the "birdlike" aeroplane of the future, but it does not help enough. It only prevents the slip from increasing in the thinner air. If weight did not prevent carrying more than two large propellers side by side, carrying more than two large propeners use by suc-after the Wright plan, the slip might even be prac-tically eliminated. But even then, if we should imagine the aerupiane propelled by a windlass quickly winding in a cable fastened to the top of a high mountain, thin air causes an increased consumption of power, because it makes the aeroplane lose its resistance ugainst propulsion. If it does not offer a drift of 200 pounds at 45 miles an hour it will likewise not lift 900 pounds at 45 miles an hour, and the motor must propel it so much faster that the increased speed flually creates the same drift of 200 pounds in the thinner atr. Not considering any silp of the propeller, which only makes matters still worse, the motor must now lift "by devialises" 200 pounds 88/100 instead of 76/100 miles every minute. In Germany these natural laws are now so ciently understood that a method has been found by which the maximum height an aeroplane can reach is quickly calculated from the amount of overload it was found able to carry in weight lifting tests near the ground. it so much faster that the increased speed finally creates

#### An Object Lesson in Road Maintenance

I N order to demonstrate the value of practical main-tecuance of highways, the American Highway Asso-ciation, the central good roads organization of the United States, has arranged, in co-operation with the Federal Office of Public Roads, and road officials in Virginia, North Carolina, South Carolina, and Georgia, for an ambitious maintenance experiment on the road m Washington to Atlanta, Ga. miles of road are expected to be improved and kept in condition as a result of the initiative of the American Highway Association. The experiment is on a larger scale than any maintenance experiment ever undertaken in this country.

The great maintenance object lesson road extends from the capital of the United States through historic section of the country, passing such famou points as Arlington, Mt. Vernon, the battlefields Run, Chancellorsville, Spottsylvania, and Fredericka-burg, ca route to Richmond, thence extending south-ward through the capitals of North and South Caro-

lina, and terminating at Atlanta.

The American Highway Association will enlist the support of the counties and districts traversed by the road, and, wherever possible, induce the local authoriread, and, wherever possible induce the focal author-ties to place the road under the supervision of Govern-ment engineers who will be detailed from the Office of Public Roads for that purpose under the co-operative

Probably 75 per cent of the total mileage has already been improved by a surfacing of atone, gravel or a mixture of sand and clay. The object of the main-tenance scheme is to prevent the improved portions of the road from deteriorating for lack of suitable care, and to make the unimproved portions as comfortable for travel as possible with the money available.

With the co-operation of all different communities, however, it is hoped that concerted work will be under-taken on the entire stretch of highway, resulting in a continuous maintenance object lesson that will be a silmulus to maintenance throughout the country. The American Highway Association has undertaken to raise oney for the traveling expenses of the engineer who will supervise the work,

Leonard Tufts is chairman of the committee design nated by the association to have charge of the cam-paign, and he has already arranged to place 110 miles under Government engineers. It is expected that all counties traversed by the road will cheerfully

#### To Our Subscribers

To Cur Sussections:

When he can be close of another year—the street minuth of the Schmitter American's High. States the subscription of many a subscriber explices, it will not be amiss to call attention to the fact that the sending of the paper will be discontinued if the sub-acription he not renewed. In order to twick any interruption in the receipt of the paper, subscriptions. uld be renewed before the publication of the first

issue of the new year.

To those who are not familiar with the Sc AMERICAN SUPPLEMENT A WORD may not be out of place.
The Scientific American Supplement contains articles The SCIENTIFIC AMERICAN SUFFILIERY COMMENTARIAN STATEMENT AMERICAN, as well as translations from foreign periodicals, the faroration contained in which would otherwise be increasing. By taking the SCIENTIFIC AMERICAN and SUPPLEMENT the subscriber receives the benefit of a re-duction in the subscription price.

#### Obitnary HENRY E. MEAD

In recording the death of Mr. Henry E. Mead among one of the oldest employees in continuous service of Munn & Co. and in connection with the SCHENTIPE AMERICAN, it is fitting to mention a few of the charamenican, a is injuring to mention a rew of the char-acteristics that were noticeable during his long career. His death came rather suddenly on the morning of November 28th, 1918, at his residence in Glenrock, New Jarsey, in his seventy-fifth year.

He was engaged by one of the original founders of the Scientific American, Mr. Alfred E. Beach, of the firm SCIENTIFIC AMBRICAN, Mr. Alfred E. Beach, of the firm of Munn & Co., in the year 1807 as a draughtenan on wood, preparing litestrations of mechanical and similar subjects thereon for the wood engraver of that period to execute. Mr. Mead had a faculty of quietly grasping the essential features of a given subject and bringing them out clearly upon the wood block, which made the resulting engraving equally clear and effective. When it is remembered that during this period, long in advance of the present day of rapid photo-engraving methods, he prepared illustrations of some of the then new discoveries or inventions like the electric light, honograph, talephone, exhibit elegraphy, and numerous new discoveries or inventions like the electric light, phonograph, telephone, cable telegraphy, and numerous mechanical inventions, it will be recognised that he covered a remarkable range of subjects. He was a mechanical artist of great care and accumer, and his work as recorded in the Scientific American will be of future historical value.

#### The Current Supplement

N this issue of the Scientific American Sufficients. Messrs. G. A. Burrel and S. N. Seibert describe and discuss the experiments carried on by our Government on the use of small animals, such as mice and canaries, to test mine gases for poisonous constituents.—Prof. E. Troussart of the French National Museum of Natural History contributes a very interesting article on the question, "Did the Horse Exist in America When This Continent was Discovered by Europeans?"—An important engineering topic discussed is that of the best limits Continent was Discovered by Europeans?"—An import-nt segiment tople discussed is that of the best limits for steam turbine units.—The recently opened Chai-tanoons hydro-electric power development is illustrated and described.—Airred E. Waller writes on dynamo-olectric lighting for automobiles.—A subject which is at the present time receiving a well-deserved interest at the present time receiving a well-deserved increast is that of asfety in industrial operations. A valuable report on an investigation of protection devices for grinding wheels forms the subject of a paper read by R. G. Williams, before the American Society of Me-chanical Engineers, and published in this week's issue. chanical Engineers, and published in this week's issue.

—F. Donaldoon writes on the sinking and linking of shafts.—There is every promise that a new industry will come to America through efforts now being made under Government anuptless to raise hyacintha, tulps and others bulbs here, Ensead of importing them, as has been the custom hitherto, from Holland. Mr. Guy E. Mitchell tells us of this development.—An automatic fire alarm whose action is based on the use of a conductor with a negative temperature co-efficient of elecductor with a negative temperature co-emcent or eser-tic resistance is described by F. A. J. Fitzgerskid—An article on Asrial Flight, by H. R. A. Mailcok among other things exposes a common fallacy regarding the use of pendium devices for stabilisting aeroplanes.

#### The Forest Service Fire-look

The Forces: Service is neededware.

FYSEE Forces forces is somewhat proud of a fire-loot

I out in the Signaruse National Propert in African

The lookout tower is built entirely of lage and project

115 feet into the air, and was built by the sansorus for

the logs at hand and with some of the mediant height

devices, being obliged to say upon the own ropies the

had at their medic house and such blocks and, tack

to a serial de la company

ra are not responsible for etak porrespendence solumn. Anonymou ofe in the core unot be considered, but the name will be withheld when so desired.]

Bide-disping of Aeroplanes
To the Better of the Sciencero America:
An addition to the suggestions on "Prevention
Aviation accidents" given in my communication pu In "success" to the suggestions on "prevention of Arithm Anothers" given in my communication published in the Scinsvirso Ausman of October 4th last, it would like to offer some further ideas on this subject with especial seferance to that numerous class of espidents due to side-slipping, as I see there were three such mishaps in Birope quite recently—one of Maiden-hea, Singland, on August 20th, snother at Melica, France, on August 31st, and the third in Buckinghan shire on September 22nd—resulting in the death eroplanists and injuries to five others.

It is obvious that the tendency to side-slip is height and and maintained by the vertical surface constitu-ing the sides of the inclosed fuseinge in many late monoplanes, and in fact by all vertical surface below the monoplane's wings, as well as by any excess of vertical surface below the center of gravity in a hiplane vertical surface season the center of gravity in a update as compared with the amount above that level. The vertical surfaces inserted just below the upper plane, on each side of the middle, in the latter models of Wright seroplanes and in the Curtus airboats are presumably latended to offset the amount of lower verpresumably intended to orner the amount or lower ver-tical surface on the forward extensions and on the floats, respectively, and thus prevent the tendency to side-slip due to the latter; but it is doubtful that this is siweve sufficient.

Now, if vertical surface were provided still higher up in an aeroplane, extending above the top plane, where there is generally a king-post, anyway, in monplanes, more leverage would be exerted by the san amount of surface during side-slipping for alding in restoring the machine to an even keel. If such a per-manent vertical fin might sometimes operate to disadvantage, as in side-gusts, a horisontally-pivoted Ver vanuace, as in anequace, a principle of the first standing surface, normally open, or an extendable and restable curtain, or series of curtains, might be used instead, such surfaces being instantly convertible into a vertical fin when needed to prevent addealipping, as

in banking during turns.

An even more efficient device for preventing sideslipping, and one that could be used either alone or in conjunction with the foregoing, would consist in dihe-dral surfaces of about 45 degrees angle situated at each lateral end of the aeroplane and preferably extending both above and below the outer tips of the planes if in the form of Venetian blinds or extendable curtains, but extending only above the planes from the tips if in fixed form as dihedral surfaces; and if these latter would cause trouble in side-guests the situation could be bettered by having them normally in vertical position extending half above and half below the wing and pivoted in the middle so as to be instantly turnable, with little effort, to the 45-degree angle at both wing-tips in case of side-slip threatening or occurring.

Besides, such vertical or dihedral surfaces at the planes' lateral ends would be of value by helping to planes at the tips and thus give increased life to com-pensate for their added head resistance and weight; for flying machine designers are at last cuming to realise that this air-rarefaction on the tops of planes is a valuable contributor to lift efficiency.

Inasmuch as these vertical and dihedral surfaces need not be at all large in order to accomplish their purpose, on account of the leverage they exert, and as they could be so easily added to even existing machines, it would seem to be the part of wisdom to so equip ali aeroplanes; for it is still too true that aviato time to "make their mark in the world" in the wrong way and for the last time! Erwen G. Serry

#### Science and Education in the Future

To the Editor of the SCHENTIFIC AMBRICAN:

Allow me to note my appreciation of your editorial in the issue of November 22nd "Science and Education of the Future.

The idea for the consideration of those who follow science that the needs of men are not purely material is particularly commendable. Until science shall deal with those problems effecting the moral status of society as now provious successing the moral status of society as a whole, arising through those workings of antural law as applied to the manner in which uses should live in rejection with such other, those learnifesule conditions outsides powerty in the midst of planty will manifest themselves.

here is more poverty in stunted minds than in the stouments. Men are after meterial chings only the ties of poverty persists. Retieve them of this

fear and the desire for better things appears. Science solve the matter of right living by applying to the stion what is intended by natural law should be. All anion te is based on physical conditions as the first man found them. Is natural law so weak a thing that there is no application of it possible to what most concerns humanity? Bacon said that "we can command nature only by obeying her." Our social state teems with errors that will not stand the test of true science. We are artificial instead of natural in our manner of ng together. There are laws governing wages, re and interest; and the laws when fully comprehended will be found to determine that equitable distribution of the products of land, labor, and caultal so necessary to produce in society that which will go to make up a harmonious whole and conduce to the moral uplifting of the race.

The church has had this matter in hand too long; and has almost utterly failed. Science should assume its proper function and take hold with all the intellie at its command, and if nothing is taken for granted but what will stand the test, science will succ

Callaway, Neb. FRANK L. HAYCOCK.

#### Humane Animal Tran

To the Editor of the SCIENTIFIC AMERICAN:

I desire to thank you for the space accorded my apal for the invention of a humane animal trap to take peal for the invention of a minimum annual course the place of the cruel, torturing steel trap that causes such agony (for hours and even days) to the hapless foxes and other animals that are caught in its iron tanth, until the trapper comes along to "empty" the

The several letters published since mine appeared show that the suggestion was thoughtfully received, but the communication from Mr. Magrath in your issue of October 25th, suggesting that one of the humane societies offer a prize of \$500 through the Scientific American. for a practical humane trap that would put the anim painle saly to death without first torturing it, is the best that has appeared, and I heartly and strongly indorse that writer's most excellent suggestion and trust that those most interested will make the prize offer a positive fact, or perhaps some humane reader of the SCIENTIFIC AMERICAN would be willing to offer the \$500 prise out of his own pocket.

If I were a man of wealth I should not invite s one else to perform a duty that I (as a friend of animals) considered belonged to me, but unfortunately I am not a Henry Bergh. I am deeply grateful, how ever, to the Scientific American for what it has done in the matter. George Foster Howell.

Brooklyn, N. Y.

#### Kites for Carrying Lifelines

To the Editor of the SCIENTIFIC AMERICAN:
The convention for the furtherance of safety at sea,
which is about to be or is being held in London,
brings to my mind an idea which has haunted me for

Every time this idea has presented itself I have put it aside on the ground that it was so obvious, that it must have occurred to many minds more conversant than with the subject in question, and by them re jected as impractical. Yet, on the other hand, I have never been able to detect any serious flaws to my scheme. To come to the point: Why are not all ships science. To come to the point: why are not an anipa equipped with kites capable of taking a lifeline ashore? It would seem to me that about 90 per cent of all ship-wrecks are off a shore, and in most cases happen while a strong wind is blowing. Kites are made to-day on scientific principles with very great steadiness and much I fail to see why a kite should able to carry ashore to leeward as large a cord as can be shot from a gun to some one, and with greater surety and over a greater distance. The shore is a large mark and the ship a small one.

Of course I have not marked out the details. Wheth

the kite should be "box" or otherwise; whether it should carry the cord as a fall or be equipped with a tripping device to cause it to collapse at the proper moment; these are questions to be decided by experi-ment, but which would appear to present trifling mechanical difficulties.

Kites are cheap and they are easily stowed Indian Mill, South Natick, Mass. John JOHN BOTT

#### A Suggestion for Life Saving

To the Editor of the SCIENTIFIC AMERICAN:

To be some or the schemers and idea which has suggested itself to me in connection with saving life at sea in that particular condition which provents the use of bosts owing to herrific seas.

I base my idea on the assumption that the man-lift-

ing kite as used occasionally in military work for ob vation purposes is a practical idea. I propose that the vessel which is rendering help should on approaching

the sinking or disabled vessel run out a man-lifting kite the sanking or dissolved vessel; run out a man-irring site. She would maneuver to windward so as to bring the line over the distressed vessel. Then following the idea which boys make use of in sending a "message" along the line, an encloses trailing light rope would be dispatched. This would run one pulley with a wind sheet The gale, or strong wind, would send this along, and as the trailer passed over the ship in distress it would be seized. The line could now be hauled down to the deck of the distressed ship and a breeches bliog with pulley could be placed in position on the main line. Then when everything was ready the trailing line would be eased out and the pull of the main line would lift the breeches buoy with its human freight into mid-As soon as it reached a certain altitude a releasing device would allow it to run toward the rescue ship. Gravity effects this, the pulley and breeches buoy running down the inclined plane. Rescue in a gale of wind and mountainous seas could thus be effected, while the use of boats is out of the question

The declivity of the inclined plane represented by the line could be regulated by the trailing rope. On easing the tralling rope out, the main kite line would rise; on haufing it in, the kite line would be brought lower. this way the inclined plane between the two ships could ntrolled and the speed of the breeches buoy and its freight governed

I have not patented the idea, preferring to place it t fore the SCIENTIFIC AMERICAN.

If you think there is a possibility of the idea being developed, you are welcome to make use of my suggestion.

R. Macdonald. Leicestershire Club, Leicester, England.

## Studying Ripening Bananas With the Respiration Calorimeter

ESSRS. C. F. LANGWORTHY and R D Milner MESSIES. C. F. LANGWORTHY and R. D. Milner of the Department of Agriculture, have published in a special bulletin, some results obtained in studying ripening bananas with the respiration calorimeter.

deration of the available experimental other data obtained shows that the successful handling of fruit during transportation, in the cold-storage ware house, and in the home depends upon a knowledge of nouns, and in the lome depends upon a gnowledge of the changes which take place in ripening, after ripen-ing, and decay, and the causes of these changes and ways in which they may be controlled 'tresent prac-tice is based on knowledge gained by experience, supplemented by work curried on in the inboratory.

The respiration calorimeter offers a new means for

atudying fruit-ripening problems. The results with bananas during the active ripening period show that the ripening changes progress regularly to a maximum and then decline; that at its greatest intensity the heat produced is equivalent to approximately one calorie per hour per kilogramme of bananas. The heat illier is a measure of the activity of one or more of the ripening processes. Analysis has shown that during ripening the banana starch is transformed into came sugar and the cane sugar into invert sugar, and that there are important changes in the character of the taunin comby the production of aroma and flavor bodies, and perhaps in other ways. It has also been found that in on to the transformation of carbohydrates there is an actual loss of this food constituent during ripen-From the data for oxygen consumption, dioxide, and heat output it appears that the heat liberdated by the ripouling banamas is due largely to the destruction of curbohydrate. The results recorded and discussed represent only a part of the material which is being accumulated. No attempt is made to draw is being accumulated. So arrespond in made to draw deductions regarding the practical applications which can be made, as this may be done more properly when experiments now under way are completed.

#### Sixteen Miles of Rough Sea in a Canoe

R. A. G. HEBGEN of San Francisco, Cal., has M. R. A. G. HEBGEN of San Francisco, San Must completed a most remarkable trip in a motor driven cance. Although the sea was very rough, Mr. His objective point at Alameda was the meds, Cal. 1118 Cojective pools.

Encinal Boat Club House, sixteen miles from Belvedere His canoe was equipped with a rowboat motor, and in ante of the waves and general rough weather which he encountered during the entire sixteen-mile trip he made the trip in a few minutes over one bour, maintaining an average speed in his motor-driven cance of thirteen miles and forty-six yards per hour. This is one of the few instances when a very severe trial has been given to the motor, and it is interesting to note that, in suite of conditions which were not of the best, Mr. Hebgen maintained an even speed from the time he left Belve-dere until he reached his objective point many miles When Mr. Hebgen passed over the water bay he crossed Raccoon Strait on his way around Yerbs

## Atlantic Steamships—A Retrospect

#### Thirteen Years' Development of the Transatlantic Liner

By J. Bernard Walker

In the autumn of the year 1900, that is to say, just 13 years ago, the NEISTIFIC AMERICAN published an article dealing with the question of the possible increase in size and speed of the fast transatiantle timer. That was the year when the old "Deutschind," now the reconstructed "Victoria Luise" of the Hamburg-American tracked "Victoria Luise" of the Hamburg-Americant Control of the Control of

on the Atlantic Ocean exist only in the inantination of the passengers; but in this case the cowners, stung by the assertion of the rival line that the "Deutschland' could not have made 23 knots on her madeu trip, deliberately skarted the ship just one hour later than the "Kaiser Wilbeim dee Grosse," which was overtaken and passed about non of the following day, and the superiority of pased of about one knot of the new ship thereby established beyond question. The enthusiasm belief the passenger of the "Deutschland" led to the the speed of the "Deutschland" led to the speed of the speed of the "Deutschland" led to the speed of the speed o

With a view to making an approximate estimate of the dimensions and horse-jow-er which would be necessary to enable a consistency of the Theutschland' type to cross the Arlantic at an average speed of 30 knots, the writer made some rough calculations and embodied the results in a drawing, published in our laste of November 10th, 1900, which is herewith reproduced. It was disclosed that a four-day, thirty-knot vessel, equipped with motive power consisting of Scotch bollers and reciprocating engines, and bulk within the limits of draught of thirty-free imposed by the German harbors of that day, would have to be 190 feet long and 87 feet broad; that it would displace 40,000 tons; and that the horse-power required would be

In view of the fact that during the intervening years, since the article was written, the during suggestions as to growth in size and speed have been surpassed, the former by the "Imperator" and the "Vateriand," and the latter by at least one of the large British battle-Cribers, we republish on the accomnaulying page the original drawings and make the following quotation from the text of the article, as published in 1900;

"Four-Day Liver.—As to the possibilities of the future, it is ordient that with our present form of futil and type of motive power, we have present form of futil and type of motive power, we have been present formed at 30 knots would require about \$8,00 to Deutschland at 30 knots would require about \$8,00 to Deutschland at 30 knots would require about \$8,00 to Deutschland at 30 knot Deutschland at 30 knot Deutschland, it would be impressed as 300-knot Deutschland, it would be impressed to put into her shell more than one half of the necessary amount of power. Evidently to secure 50 knots a tarper boat would be required, and a larger boat monite his creased power to drive the increased weight. The increased power to drive the increased weight. The increase in power, however, would not be directly proportional to the increase in the displacement, the tourer ship being ton for ton easier to drive, because of the reflectment of her lines due to her greater length. Newartheless, by the time we have designed a boat large enough to carry the power corresponding to a speed of 30 knots, we shall have upon paper the mammoth ship represented in our drawings. She will be 380 feet over all, 87 feet in beam, and 30 feet in draught, and will displace about 40,000 tons. Engines of 110,000 horsepower would be required, and even fit tiple screws were used, it would she necessary to develop 37,000 horse

power on each shaft—a task that would stagger the best of the world's engine builders of to-day. Profifour double-ended Secute builders would be required to supply the steam, and during each day's run of twestyfour hours 1/10 tons of coal coating 87,100 would have to be fed into the 352 turnaces. It would require 7,200 tons of coal to carry the vesset to Plymouth and 8,500 tons to take her to Hamburg, the cost of the fusi closs being \$80,000. The ship would have to stow 9,500 tons of coat in her bunkers for a single trip across the Atlantic.

"To anyone who has watched the reverse bending strains to which a ship like the "Destachland' is subjected whom she is being driven across the Atlantic seas, it is evident that we have come to a point where it will be necessary to give increased longitudinal strength to any vessel that acceeds the present length

The bow of this ship (the "Imperator") reaches 56 feet above the sea; the captain's bridge is 75 feet above the same level.

The towering topsides of a modern liner

of 700 feet in a four-day liner this might be prosided for by running a longitudinal stiffened builkined, catending from the keet to the promenade deck, through the vessel between the after enther-room and the forward boiler-room builkined. The vessel might be further strendthened by carrying up the side plating to the promenade deck, which is placed one deck higher than in the Deutschland, and by doubling the plating at the blikes and at the promenade deck, as shown in the middling bection of the ship.

"In conclusion, it is safe to say that such a vessel as

this will nower be built. We shall come the atlant in four days, but not with a vessel of this type. We higher speed will be attributed, nor for statisficiality ended and boilers weights, but ratther by mentiophing reason and boilers weights, but ratther by mentiophing reasons and coming speed, and utilities, owner profits and coming speed, and utilities, owner profits of the way of economisters, superheaters and tisel-twiner least the "Arrow," described in our last sense of the times at the "Arrow," described in our last sense of the times at appearance within the next flow years, it is suffer by all the state of the sense of the Parsons type. So gives will be fine duction of weights and stury of appearance, the sense of t

to produce on a displacement not much greater than
that of the 'Destactions' a 80-knot occur
steamer that shall have aqual accommodations for passengers.

to the commondations of the commondations for passengers."

It is interesting to note, after the lague of thirtsee years, to what extent the prediction of 1900 has been fulfilled in 1913, in the first place we find that, in order to give the proper girder strength, the doubling of the plating has been incorporated in the present-day ships of 600 to 900 fact length. The "Maurenain" has three-fold plating 3 inches in aggregate thickness for some 800 feet amodality, a special steel of high tensile strength being used. The "Muperator" has double plating, and in both of these ships the girder strength is further assured by constructing the main and other upper desits of steel such by a great increases in the plated depth of the ship. The "Maurenaina" is plicted to a depth of sixty-one first, and the "Imperator" to a depth of seventy-three and one half feet. The smociation of steel decks and doubled plating with great depth of ship sakes it unnecessary to use the central longitudinal builthead which would have been necessary in our four-day boat with its relatively shallow plated depth of about fifty-two feet, shallow plated depth of about fifty-two feet,

More striking, even, than the increase in length is the great beight to which the structure of the modern liner has reached—a fact which is clearly shown in the shadow picture at the bottom of the accompanying nace, in which it will be sens that the topmost deck of the "Imperator" is level with the tops of the amotestacks of the "Deutschland." The "Imperator has no less than eight decks above the waterline, as against four in the "Deutschland." From the waterline, as against four in the "Deutschland." From lead to the varieties, as against four in the "Deutschland." From less the waterline, as against four in the "Deutschland." From less the waterline, as against four in the "Deutschland." From less thought the waterline, as against four in the "Deutschland." From less thought the waterline, as against four in the "Deutschland." From less than the waterline waterl

But the "imperator," on a draught of 37 set and a beam of 98 feet, has ample stability to carry her towering superstructures. In 1800 the steam turbine was yet, in so far as occan steamers were concerned, in the experimental stage; and, as we showed at the time, the three triple-expension estimes for a four-day "Destrehland" would have reached a size for-sacto unit of \$3,000 home-power. We queedlon whether the steel gaskers of that or of this day, for that matter, would have chard to gaurantie hollow-forged sharting to carry safety a load of this magnitude.

The first notable step toward the 30-knot limit was

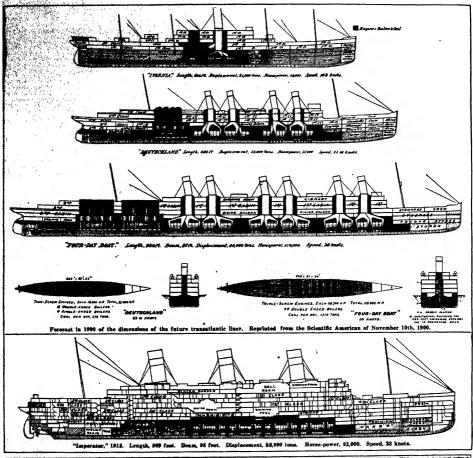
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"Ivernia" "Deutschiand" Four day liper "Imperator".	21,000 23,000 40,000 56,000	10,500 87,000 110,000 62,000	16.80 28.86 80.60 98.00	\$1 625,000 3 200,000 5,200,000 8,800,000	180 872 1,710 1,000	1,980 4,980 9,960 8,900	13,610 690 Mone 200	1 100	202 200 485 602	Siresa Siresa Siresa Siresa Siresa	1 8 8 8 2 8 8 8	1111	==

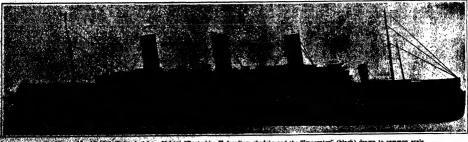
of the

MANAGEMENT AND THE

ocrisians, a ship of nearly 30,000 tone full-load incompite, has made ever 30 knots for many hours, see it certain that, if any transatiantic company 4: to make the escritice in carrying capacity which the incompany, it would be possible, with the use chieflon genra, to design a turbine-driven ship of gine that would make the passage in four days, matters now stand, the "Impector" represents best all-round combination for securing fair speed, t see worthiness, absolute reliability as to the time

of passage, and a reasonable return on the investment, that can be devised. When, in the course of the design of this ship, the question of speed came up, an investigation was made as to what sacrifices would be necessary if the speed were raised from 23 to 23 knots, and it was found that at least two of the upper decks would have to be sacrificed; that the bull would have to be fued of until the displacement and therefore the carrying capacity had been greatly reduced, and that Consulted on saces 451.1 (Concluded on page 481.)





The "Describent," 1806 (Butt maste); a 25-inst "Destachland" (medium shade); and the "Imperator" (black) drawn to common sca-ATLANTIC STEAMSHIPS PAST AND PRESENT

# Here is the Biggest Mannobile in the World

depth and width of seats with those o ling from \$1000 up to \$1400 "Il find this is a "big" car in inches SEND FOR THE BOOK



# Extravagant Assertion?-Let's Analyze It

IT IS THE MOST PORNIDABLE -(vel



## Send for the Book

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Dear Sin:
I would like to know more about "The BIGGEST" AUTO BLE IN THE WORLD."
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MAXWELL MOTOR COMPANY

The region of Messier II. seems literally powdered with stars. It is hard to believe that these white dots are all stars, many of them brighter, hotter and bigger than our sun.

## How Many Stars Are There in the Milky Way?

#### A Great Astronomical Problem and How It Is Attacked

By John W. N. Sullivan

ted With Photographs Made at the Yerkes Observatory

O N a clear monthess night, if the sky be attentively observed, a dim, broad, freeguier patch of light may be seen, sweeping right across the heavens from horizon. This long and featily lumihous cloud is known as the Miky Way, and it does in truth make a complete circuit of the heavens. If observation is assisted by a powerful tolescope this hand of luminous have leaven to countiest of accounted multitude of states.

haze is seen to consist of a countless multitude of stars.

It would seem that any attempt to calculate the properties of a system of such exceeding complexity must be fore-doomed to fullure. Nevertheless, it is possible, by mathematical reasoning, to reach certain conclusions respecting the constitution of this object which are of the highest interest and importance. The mathematical methods necessary for such an undertaking have been developed by Maxwell, in connection with his researches on the theory of gases. A gas is regarded as made up of an immense number of very small particles, moving about in various directions and with various velocities. se small particles act on one another at a distance but in such a manner that at a distance large compared with their own dimensions, their mutual action is inappreciable. But if two such particles come sufficiently close together, they perturb each other's motion, and the result is a different distribution of velocity. The fact that the particles are present in enormous numbers and that their motions are random ones, renders the application of the theory of probabilities possible, and on this basis many of the characteristic properties of gases have been satisfactorily explained.

Lord Kelvin, by a bold imaginative leap, jumped from the consideration of a gas to the Milky Way. There also we have an immonspunumber of bodies moving at random, perturbing one another's motions at short distances and exerting no appreciable effect at large ones. To the mind of some super-human being, to whom the stars of the heavens appear as molecules do to us, the Milky Way is but a gas, free in space. The statistical methods of calculation introduced by Maxwell may be used in this case also. Among other things, we are in a position to calculate the dimensions of the Milky Way, from observations on the velocities of the stars

It is asswer resorved from its containing reseal and forf. free in space, it would, under the action of the nutral attraction of its particles, assume the form of a sphere. At the center of such a sphere the pressure, the nutral attraction is a sphere at the pressure, the center throughout the substantiant of the particles, and the pressure, the nutral transition of the sphere and the sphere attraction of the sphere and that the kinetic pherical particles and compatible with the hypothesis of a homeopascous of compatible with the hypothesis of a homeopascous

sphere.
This theoretical result, that there are one billion stars in the Milky Way, is the same as has been reached by telescopic observation, a fact which is distinctly sur-

Action in the

prising. For the theoretical result gives the total sunber of stars present, while telescopic observation can only give the number of bright stars present. From the concordance of the two results it would appear either that there are no dark stars in the Milky Way, or that their number is altogether inappreciable in comparison with the bright stars. We shall see that this result is rather disconcerting when considering the age of the Milky Wer.

In rearrding the Milky Way as a gas we have not been sufficiently precise in our conceptions. Everybody is now familiar with the fact that Crookes discorrend the existence of a fourth state of matter; matter which is notifier sold nor liquid har gaineau, and which has been named radiant matter. The difference between radiant matters and a gas is quite easy to green? If it is a vessel contacting particles of matter is matched the chances are that a particle, in traversing the vessel, will appear one on or more conflictions with other particles, then such an assemblage of particles is existed as an If it is possible for the particle to revenue the vessel without collision, the nature is said to be good and, so that an assemblage of particles which is, one vessel is a gas may, in a washer vessel, he is the reference and the control of the place is a state of the particle of the particles and the real case. It is not so made to the place is a state of the control of the place is particles, which is the paper including the corts of the places is provided only over one extravel and the particles are a fact to now therefore the particles are a fact to now the particles a

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The Blessings of Science on the Battlefield

FY HE Franch expert. Dr. Helme, a whose decidedty airming discussion of the wounds inflicted by modern weapone has already appeared by modern weapone has already appeared to help a first the second of these articles and F. Breiser. Dr. Heliade's object, in the second of these articles as a F. Breiser. Dr. Heliade's object, in the second of these articles are the second of the s

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has share great changes in the principles upon which it is a simulator to the vession of the principles and the principles are the principles are



The spiral nebula Messier 51 in Canes Venatici. The Milky Way may be such a spiral nebula.

a fatal issue may be expected. Lastly, the days of rapid, rough-and-ready military surgery—of bullet ax-intenset and limbs amputated on the battlefeld—are gone by Modern surgery, with its audacity of scope and ultra-reliancement of method, demands too great attention to details, too perfect a quiet in its curricularies, and too build the for operating, to permit of the days o

leging practiced amplitude of battle.

"Br. Helms is of the opision, at the same time, that our generation, with its over-stimulated and over-outivated nervous system, is quite incapable of enduring the pain and nervous shocks through which the property of the proposers of Nanoleon's armine managed to He.

sards of Napoleon's armise managed to live.

The actual course of events with the wounded solder is thus dramatically detailed. With eyes fixed stright in from sot him, and filled with the warlike intoxication which eliminates the instinct of self-preservation, the soldier follows the orders of his leaders until he feels himself hit. Then another instinct than the ardor of bettle takes possession of his whole being; he now thinks of nothing but finding his way to the wretched company of the stricken, to share his sufferings with them. In this way there are formed on the field of battle what General Trousshit (the surgeon-in-chief of the Franch army) calls "nests of wounded," Here the

medical students and young doctors have congregated in the mids of the troops, provided with morphise to hill pain, caffeine to stimulate the heart, and servan to repair the tissues wasted by loss of blood. The three great dangers to be met in these early stages of the case are asphyria, hemorrhage, and infection. Against the last of these three the French soldier is fortified by a little peckage which he is obliged to carry with him as part of his require field kit. Within its outer covering of gray lines this package contains another, an impermental envelop, and inside this again is a provision of aseptic lint covered with fine gauze, besides a large bandase and two safety pins. Outside is a label on which are printed explicit directions for the use of this first-aid (or panament unitedieds) apparatus. If the soldier is wise and provident, he will have throughly mastered these printed instructions long before the necessity for applying them arrives; if he is only the average human recruit, and has never looked at them until his hour of anguish arrives, he ought even then to be able to understand their large, heavy type and simple precision of lancings.

The next thing for the victim to de will be to take

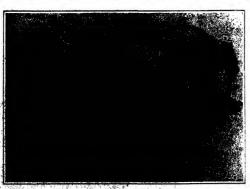
The next thing for the victim to do will be to take advantage of the first tuil in the fighting to drag thin-self to the nearest medical post, or "nest of assistance," which ought to be 1,050 meters (4,921 feet) or 2,000 meters (6,922 feet) to the rear of the titing time. Here his wounds will receive heir first selecutific dressing with antiseptics. At the same time the case is diagnosed, and a ticket is pinned on to his cond—are deticket, if he is to be removed to the base hospital, a white one, if he is to be left where he is. In the former case, he will be carried off on a scientificatily constructed stretcher (breacourt), the Freuch type of which is the Eybert, a countrience as constructed as to be available for transporting the wounded man either in a wagon, on the back of a music or on the back of a hospital orderly. For the last of these means of transportation, the brascerf is strapped, nearly upright, to the force beed, shoulders and hips of the bearer, so that the patient may keep the sitting and slightly prone position desirable in cases of abdominal lesions and known as "Fowlers" position."

So much for the routine of gleaning the human harvest while and where the buttie will raps. When the turnell and acute danger lave shifted elsewhere, it is possible for the ambitances to make their rounds and pick up the wounded. The modern army ambulance (these are stricted to every French erany corps) is a field heaptal on wheels, equipped with facilities for immediate transment of cases in which delay would estail serious danger. The "field heaptal" of thirty years ago is now only a memory. The ambitance, an automobie, takes its load as quickly and with as little diding a possible to the base hospital, where the veteran surgeons, Red Cross nurses, and all the healing resources of modern science are to be found, and quickly and orderly conditions almost as favorable to the pattern

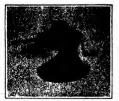
ages bearing the red cross or regengines bearing the red cross or regengine to "To return to the attifield, the work of the surgeons and their orderites does not call with day. At night they have to secur the country and gather in wounded men who have been unable to find the description of the surgeon of course, provided with lanterna and in this connection Dr. Helme describes the Gresard Berther light, which is specially constructed for the service of the wounded in war. It is an acceptable light, provided with a reflector, which brilliantly illuminates the ground within a radius of 8 meters (20% feet), but a guite imperceptible beyond 400 meters (1.512 feet) — as fe distance, considering that insolt surgeon within anything like so short a ranges now-adoys never encomp within anything like so short a range.

In this work the traditional friend of man, the dog tribe, also takes parl, represented by that German development the Santitatahusd and his Franch version, the chien antitaire. The method of the German Santitishund is simply to find a wounded man and then bay over

ed man and then bay (Concluded on page 481.)



My 1.—The division of weight necessing to location shown in the human body. The 3.—Constitution for transporting wounded man on the book of a hospital weighty. The 3.—Satisful of carrying the wounded on mule back.



The interior of one of the side-cutter

## Inventions New and Interesting

Simple Patent Law; Patent Office News; Notes on Trademarks



Another interior view of the side-ent-ter sharpener.

Pencil Sharpeners

A LARGE number of mechanical devices for replac
ins, the penkulfs in removing the wood and point
ing the lead of the ordinary lead pencil have been invented. It takes a keen knife and no little skill to nivenired it takes a keen kinte and no little skill for sharpen a lead pencil quickly and without waste and yet nearly eversone likes to have it neatly treated hence the legion of pencil sharpeners ranging from the little cone sharped pocket device of boyhood days with a fixed blads for shaving off wood and lead when the sharpener was twisted about on the end of the pencil to the well-designed machine for serious, con nuous business use
The usefulness of a lead pencii is practically hindered

The usefulness of a lead pencil is practically hindered by the fact that not everyone can keep a possell sharp-ened simply because not everyone knows how to handle a peakerife Moreover cutting the graphite lead" dulls a good knife blade rapidly. The section of the pape-pencil (in which a fresh length of lead is exposed by simply slitting the pencil and uncurring a strip of paper) avoids this operation where a sharp point is not necessary. Where many pencils are used as in

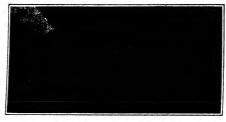
schools, offices telephone exchanges, some quicker of more efficient means of keeping the pencils in good edition than by the hand whitting method become

imperative.

The ideal device for this purpose should i The total device for this purpose should first of all aver time, as compared with moderate skill by the primitive method. The auditor of a large railway system an enthusastic uses of pencil sharpeners for his 120 clerks, somewhat humorously estimates the saving of time on each pencil sa 10 minutes, divided as follows Borrowing neighbors knife, 2 minutes, sharpen-



In this machine the cutter is at the side of the pencil



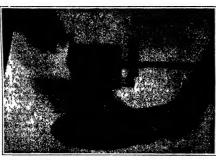
A little device which removes the wood and points the lead by two separate



A pencil sharpener that closely simu-lates hand whittling.



Another representative of the whit thing lead pencil sharpener



Employment of a milling cutter placed at one side of the pencil.



The sandpaper wheel for use in sharpening pencils.



A representative pencil sharp the what ling type.



Sharpening a pencil by a pair of cutters revolving around the point while rotating.



A type of clean and effec-lead genell sharp

وأباراها أدار المالية

6 minutes.
Il starpener should also
possible, not only in the
p work, but in protecting
section. It should waste
at saids shoupening, and fitted: powed adaptement should also minimised by demittin, seed only in the 11 shirepening work, yet in protecting point from benefits. It should wash out from benefits, the protecting of the least at shoul shirepening, and other benefit in long use for the penalt, hought do distinctively, next work while thing the delling of positives and do y with the litter which noing a knife anses. If these sequirements are acti-actority fulfilled the device may still be sulty through its tendency to break the In the hand-whittling method, given keen peakuife, special skill in sharpen-ig a lead pencil is required to point the ad after the wood has been whittled ay. The expert human pencil sharpener porting the exposed length of the lead the ball of his finger to ease the chut-ering pressure of the knife edge. It is say that scheming to deal with this ate operation has been the main probtem in the majority of pencii sharpening ces that have been invented.

In this connection it is noteworthy that many pencil sharpeners which will give good results when new, will break the pencil point by the looseness or side mo-tion of the cutting tool when the bearings of the machine become worn; and the bearings of a pencii sharpener are particularly liable to become worn by foul-ing with the gritty pencil lead litter in the of the m

ering some of the repres tive pencil sharpeners it is interesting to divide them into two broad cleaners. ing to whether the device works by a spe od, or like a sort of automaton penknife neer. Many machines for use rming a given work are not imits tive of the primitive hand labor operation which they are designed to supersede, but have a new and special way of doing the work. For example, the ordinary so machine does not pass a common h wife's needle completely through the fabric on which it is working, but utilises a spe-cial needle, with its eye in the point, which it stabs in and out of the fabric. Just so the majority of the pencil share-Just so the majority of the pencii shari-eners which have seen the light of actual use remove the wood and point the lead in a way of their own, and not by an imitation of hard whittling.

Perhaps the unjority of pencil sharpeners of both these classes are little machines arranged to be fastened to the wall or to a table and having a crank and One popular type which does the by a method wholly different from work by a m hand whittling has a rair of small bevoled milling cutters which while rotating indi vidually revolve as a pair about the pencil ng away first the wood and late the lead as the pencil is fed through s clamping support in the axis of revolution of the cutters. One object of this design with two cutters bearing against the pe point from opposite sides is to relieve th exposed length of lead from the side strain which is so liable to break it. Several other sharpeners of this type, however have a single cutter driven from a gear wheel and cutting from one side of the only, the pencil being gradually turned as the work proceeds. In some of machines the pencii is hold in a simple friction clamp in which the operator turns the pencil about; in others, the satically rotated. A recen nachine of this type utilises the milling with a spiral cutter having 15 inches of cutting edge, designed to make a ood point without strain on the lead. The encil point is supported against a straigh edge while this cutter is at work on it, and the last gives an extreme 'draw out."

Another machine, an evolution from the schoolbay's toy which has been referred schooling's toy which has been referred to, is designed to protect the wood-cutting blade from being fulled by work on the puttil lead. Turning the creak rotates the pentil lead's Turning the creak rotates the pentil lead's rapidly against a station-say lead's rapidly against a station-say lead's plade which takes off a thin sightly shaving from the wood of the pentil until second of the pentil s

aive tool then the interest to a po of them coming into play to grind

Several forms of sharpeners which freakly indicate whittling have a disk carrying several sharp knife blades ar-ranged radially which rapidly sliver the wood of the vertically held pencil as the disk is rotated. Slowly turning the pencil about and at the same time feeding it downward in its clamp closely simulate the action of a penknife in skilled hands One representative of this type has the knives arranged to draw out the pencil point. Another handy little desk device, weighing less than three quarters of a pound, sharpens pencils by a reciprocating motion of a single adjustable blade carried on a rocking arm. The pencii is laid against a support in a slanting posi-tion and the blade is brought into action by a downward push instead of by the turning of a crank, so that the d does not need to be fastened to any sup port, but may serve also as a paper w The base is cup-shaped to catch the penci cuttings, and stands on three rubber-tippe feet. This same chisel motion of a blad is utilized in another compact sharpener equipped with a vertical plunger like a dating or numbering stamp. The blade has 4 inches of cutting edge and it is kept in condition automatically by a sharpen ing stone, which is held against the b by spring pressure. In this connection mention should be made of the little per cil sharpeners which may be found in som stationery stores—an attractive miniatur jack plane for the desk or pocket.

#### An Efficient Air Deflector

AN apparatus for changing the direction of a current of air with the minimum loss in the velocity of the same has been recently designed and patented by H. L. Van Zile of New York city.

iple involved is sh The prine mpanying illustration.



An efficient air deflector.

In this deflector a series of curved va in this deflector a series of curved vane are placed at equal distances from each other, presenting their edges to the cur-rent, and dividing the same into indepen-dent strata. Each independent portion rent, and dividing the same into indepen-dent strata. Each independent portion implages against a vane, and after being slightly deflected proceeds to the end of the protected passage without further loss of energy due to any impingement of the balance of the current. The cherry actually lost, neglecting sich-friction, is due to the impingament of the stratagainst the lower portions of the vasas. As application of the above principle is made for windows. With this device the wind is addasted to a vertical oursety inside of the room with a loss of only 18.3 per cent of its velocity. The enemy of this vertical oursets in stiffledent to deflort as horizontal current is stiffledent to deflort as horizontal current entering the window over the deflector, the amount of such deflection and the resulting direction being degendent on the relative strength of the two currents. It is, therefore, possible to have the lower sain raised above the

deflector and still have the incoming air traveling to the upper portion of the room without disturbing papers on deaks or without disturbing papers on deaks or tables. This feature, unique for this deflector, is very important during the During winter the sask can be adjusted to admit only the amount of air desired, and as this air will travel vertically at 87.7 per cent of the velocity of the outside wind, it will mix with the sated air at the top of the room instead of producing cold currents at the lower

Recent investigations by well-known ow that the movement of air in a closed room is almost as important in a closed room is almost as important as the entrance of fresh air. This deflector accomplishes both results with the mini-mum amount of cold air owing to the high velocity of entrance.

#### A New Idea in Ink Erasers

NK erasers need improvement. Knive out and acrapers roughen the surface of paper; rubber mixed with powdered gla or sand wears through and is apt to tear the paper, white chemicals discolor the paper and obliterate ruled lines, as well as the letters or figures they are applied to. A Syracuse inventor, Mr. J. K. Rush, eds on a different principle and

The eraser he perfected consists of a The eraser he perfected consists of a brush made of especially prepared mineral fibers and containing no less than 4,000 strands each. As the brush is only one eighth of an inch thick and three eighths of an inch wide, it will be understood that h of the 4,000 strands of fiber is ex ecedingly tenuous; but they give to each brush just 4,000 microscopic, dlamond-like points of peculiar sharpness, and together hey form an erasing edge that is flexible durable and extremely efficient. brushes are not made of asbestos or min ol, but of a substance more like spun

Each brush is two inches long and is contained in a tube of aluminium and German silver that is three and three quarters inches long and three eighths of an inch in diameter; turning a German silver cap on the end of the tube moves the

rush in or out, as required. Especially well adapted is the new moving single written or typed letter figures from a line or column neatly and without affecting the adjoining marks, and it leaves the place of the letter or figure fit for use again without danger of blurring

#### The Death of William Deering

N the death of William Deerlug, one of the founders of the International Harvester Company, and himself long the head of the Deering Harvester Company, the American machinery industry loses one of its most conspicuous figures.

Originally a dry goods manufacturer and merchant, Mr. Deering eventually migrated to Chicago, where in 1870 he met E. H. Gammon, who had bought the rights to manufacture a harvester Three years to manufacture a narvester. Three years later Mr. Deering became the active head of the enterprise. Gammon told Deering that a machine was needed which would bind sheaves of wheat as they were cut. Deering began work upon this, and with J. S. Appleby invented the binder that is etill in use. He is said to have left a furture of \$30,000,000, most of which was made out of agricultural inventions.

Deering is one of the men to whom America should be grateful for his nehlevements. It was his self-binder that made it really possible to harvest wheat without the aid of much manual labor and that places the name of Deering beside that of McCormick. How much the Deering binder has contributed to our agricultural prosperity no one can even guess

A Worm That Operates Car Coupling Kauckie er Heek.—Joseph Kovace of Kulpment, Pa., in patent No. 1,073,352 provides a segmental coupling member movable in an aro in the draw-head and on its otter also a worm gen menhed by an operating worm journaled in draw-head.

#### Notes for Inventors

Dr. B. W. Pond Resigns After Forty Years as Examiner.—Because of ill health, Dr. B. W. Pond has resigned after forty years' service in the examining corps of the Patent Office. President Wilson sent a letter to Dr. Pond thanking him his many years of service, and compli-menting him on the record he has made while in office. Dr. Pond was in charge of a very important division of the office. in which he looked after all inventions affecting cavil engancering, bridge building, hydraulto engineering, and excava-tiou. He is a native of Maine, and was graduated from Bowdoin College. He entered the Patent Office as third assistant examiner in 1873, and four years later was made primary examiner, which pos-tion he has filled for thirty-av years.

An Elihu Thomson Patent, -Putent No. 1,072,530 has been issued to the General Electric Company as assignee of Elihu Thomson for an electric heater in which a heat storage mass having good conduc-tivity constitutes a wall of a heating er, while heat manlating means con stitute the remaining walls of the said er and means are provided for producing an electric are within the chamber for heating the storage mass.

Nine Car Truck Patents,-Herbert H. Hewitt of Buffalo, N. Y, has secured mue patents, Nos. 1,072,719 to 1,072,727 in-clusive, for improvements in car trucks including improvements in the car axle journal boxes proper.

An Advertising Ventilator.-Robert E. Carswell of Minneapolis, Minn., provides in patent 1,072,821 a combined ventilator and advertising device in which there is produced upon a suitable surface a repreentation of an automobile with the wi having passages alined with them and the wheels rotatable and having, in their spoke zones, propelling lilades so that the wheels will be rotated by a draft of air moving through the air passages alined with the whoels.

A Number of Dental Patents.—Frank H. Skinner of Chicago, Ill., has secured patents Nos. 1,072,517 to 1,072,521 inclusive for various forms of crown pin extractors including jaws for gripping the pin and means co-operating with the jaws for pulling the pin.

A Shiftable Individual Telephone Mouth Piece.—In patent No 1,072,537 Clarence S. Warren of Milford, Olno, shows a telephone mouth piece which has a band to fit around a telephone transmitter and a number of individual telephone mouth pieces carried on arms pivoted to the hand so that each individual month niece may be applied to and removed from the shone mouth piece as desired.

A New Patent Office Mail Order .new Commissioner of Patents, under date of September 5th, 1913, has given notice to those transacting business with the Patent Office that all mail matter arriving raten vince that in man matter arriving at the Washington post office up to the hour of closing business at the Patent Office each day will be entered as received on that day—Iu carrying out this, suntable arrangements have been made by the local post office.

Another Reinforced Cement Tle .- In patent No. 1,071,291 Lonis Blessing of Jackson, Mich., shows a railroad tie of coment in which is embedded a longitudinal tension rod bent to have lower portions directly beneath the rails and its intermediate portion bent upwardly to form a truss inidway between the ends of the tie Milk Drying Process.—A patent No. 1,071,692 to Powdered Milk Company of

I,071,582 to Powdered Milk Company of America of New York city, assignee of Charles H. Brigham of Brooklyn, N. Y., presents a process which converts the liquid into a spray and causes a large amount of drying agent in the form of an envelope of forcibly projected air intro-duced under pressure moving in the same direction as the spray and traveling around it in such a manner as to present at each point on the path of the spray successive quantities of the drying agen

#### RECENTLY PATENTED INVENTIONS

These columns are open to all patentee
The notices are inserted by special arrangtionent with the inventors. Terms on application to the Advertising Department of the
Scientific Americas.

#### Pertaining to Apparel.

Pertaining to Apparel.
REMOVAILE ANTIANS HAT LINING.—
REMOVE HAT LINING HA

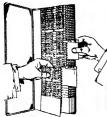
#### Electrical Bevices.

KIECLYSEA DECEMBER 1306
LINE INSULATOR O, C MEDIERACH, 1306
Avenue B, San Antonio, Tex. The more particular purpose of the inventor is to provide
an insulator suitable for use upon telephone



and telegraph lines, as well as upon lines for general service of various kinds, a special ob-ject leng to lunprove the insulation of the line and at the same lime to render the con-struction comparatively clean, simple, and in many ways efficient

Difficulty CARR--II. Nieres. Shettas. Kan. It is an object in this invention to provide a case in which the opening of the cover will automatically lift the tray to a position to effectively dispusy the proofs, and in which the opening of the cover will automatically lift the tray to a position to effectively dispusy the proofs, and in which lower the tray and inclose the same. ACCURITY INDEX.—WE ROMAIN ENGAGE OF SAM Automatically 18 in 1 of 10 p. Filks Mild., 217 Avenue E. Rana Automatical Text The object of this invention is to provide such an arrangement that crossessing the validation of the cardio being reversible and each having upon



ACCOUNT INDEX

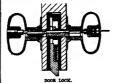
its opposite face a symbol which when turned to view will serve to call attention to the par-ticular card. The cards and litely supports may be reversed. Thus, the cards on which the accounts are due may be turned so as to expose the indicating vaniod, and thus permit of the account due orats being rendity and quiesly distinguished from the remaining cards

#### Hardware and Tools.

Bardware and Tools.

ACTUATING DEVICE FOR WINDOW SHAPE ACTUATION OF THE WINDOW SHAPE ACTUATING DEVICE FOR WINDOW SHAPE ACTUATION OF THE WIND

DOOR LOCK DOUR LOUK. PLEASANT IT MATERIAN. home, Othe. This invantion prevides 4 com-bined door latch and lock. An object of the improvement is to reduce the trouble and ex-pense in fitting a lock in a door by providing



a lock which may be inserted in a cylindrics opening made by an ordinary brace end bi-without the necessity of mortising the door Further object is to reduce the number of part-and to lessen the cost of a good substantia

Heating and Lighting.

ELR-TRIC HEATEN - W. Dealles, 176 N.
4th Rt. Brooklyn, N. Y. The laverdion relates
to electric heaters and the object is to provide
an improved reducting element for this class
of devices, as well as improved means for supporting the same to enable it to be convisicus to evidence to the convision of the convision to evidence to the convision of the co

can be obtained.

STAGE FUOTLIGHTING.—C. M. TATLOR
Loyal, Will. The invention refere more particularly to lamps mounted on a carrier which
is alidably mounted in the structure of the
stage floor, and means for adjusting the lamp



carrier with reference to the floor of the stage It provides a structure for footlights wherehy a variation in the quantity of light throws by the same on the stage can be arranged; reduces the space occupied by the footlights; and makes it possible to atilise the entire floor space of the stage when the lights are not in use, that is, are in inoperative position.

use, that is, are in inoperative position.
ELECTRIC WATER HRATER.—J. POLAK,
1381 Madison St. Brooklyn, N. Y. This inproved electric water heater is characterized
by a number of concentrically arranged heat
ing elements, the spaces between them forming



RISCIBIO WATER HEATER.

chamiers through which water flows, the heat ing elements being surrounded on all sides by the water, means being provided whereby the volume and temperature of the liquid may be regulated or controlled.

Machines and Mechanical Boyle

Machines and Mechanical Services.

WIND DEFICE FOR APPOSIATIC MUSIC-LAL INSTRUCTION FOR APPOSIATIC MUSIC-LAL INSTRUCTION AND APPOSIATIC MUSIC-LAL INSTRUCTION AND APPOSITE AND

MOD GRINDING MACHINE.—E. S. CRAI-PANT, Grand Merc, Quebec, Canada. The in-vention provides a machine with removable toolth spaced apart and arranged in series to tween the passing testib their gued as to pro-duce a shearing settle on the wood live fed thereto; provides for progressively increasing the speed of the grinding members; and pro-ting speed of the grinding members; and pro-tace the speed of the wood live for the macerate the wood particles delivered Ener-trement of the product of the pro-ture of the product of the pro-macerate the wood particles delivered Ener-trement of the pro-

letween.

PUMP WORKING BARREL.—J. F. Err.

BUND, WORKING BARREL.—J. F. Err.

BUND, T. Wallace, 410 Caples Bldg.,

El Paso, Tar.

Under the purpose of this letwartises

by the friction of on public of additional or an influence of the public of the purpose of the pump as to make it thoroughly reliable in practical operations.

APPARATUR FOR REFINING IRAD.

J. P. BRATTIR, 457 E. Sixts St., Hammond, Jnd.

Jr. Brattir, 457 E. Sixts St., Hammond, Jnd.

In order to reduce lead by resouring gold, silver, arreade, teilurium and other impurities that invastor makes use of two separate crystallisers and two separate bettime, the betties harresultant liquid in one crystallizer into a ket-tie to be transferred to the other crystalliser. CONYENER. J. J. Crarts, 1900 W. 6th St., Carvesond. Brooklyn, N. X. The aim of this invention is to provide a conveyer construction comprising executally as endiess belt or equivalent comprising executivity as endiess belt or equivalent comprising executivity as endiess belt or equivalent comprising executivity as endiess belt or equivalent celements around which the belt



passes, certain of the pulleys being so constructed that the printed sheets held it clamps are not displaced therefrom, there being an other pulley for opening the clamp whereby the abset certified thereby may be deposited in a suitable receptacle.

a suitable receptacle.

EINDMATOGRAPHIC APPARATOS FOR
TAKING AND PROJECTING VIEWS BY
MARNS OF PHOTOGRAPHIC PLATES.

REAS A. ROSIN, Puris. France. This invenmatographic apparatus wheath pictures are
projected upon a acreen in such rapid succession that the effect of morement is obblinde,
and wherein means is provided for projecting
and wherein means is provided for projecting
thinse.

Sime. STEMARINE CULTIVATOR AND HAS.
VENTER.—N. A. LIPROK, Bristol, R. I. This
inventor provides a machine which may be
exployed to cultivate and for enhantize fishemployed to cultivate and for enhantize fishand to barvest the yield thereof; constructs
and arranges a machine which may be employed to gather, sort, distribute and store
the said yield; and provides a supporting resto be said yield; and provides a supporting resto premit the roll of the reseal without damping the angle of operation of the gathering
device.

GVIC.

WATER GAGE COCK.—D. Davisse, TTS

North Second West Ht. Salt Labe City, Utah.
An object here is to provide a device having
a morable vaive ment arranged to be towaght
portait the confirmed arranged to be towaght
portait the confirmed arranged to be towaght
means permitting the removal of the vaive
means permitting the removal of the vaive
while the bolte is still under soloni, pissuance,
FORTABLE AUTOMATIC COUNTRING 200VICE.—B. M. MCCLECON. see of Clink. EX
JUNEAU AUTOMATIC COUNTRING 200
AMONG 100
AMON

Ing. the question of week comments, pleases and the processing processing and the world and brokered processing and the world and brokered projections.

COMBINED MUFFLEE: AND OIL: PRODUCER.—A. O. Bracocci, Palarina. This invention relates to combined multired oil gas producere, particularly adapted for nection within the enhance place of must be combustion cagine, the object being to gave a construction whereby the functions game presented in such a device may be readily.

effectively accomplished.

R. O'ARE EMPLISH.—T. W. Moons, decreased in T. Y. Moons, administrator, kilmail, Fils. This invention has reference to a new and improved eagine of the rotary type, in which the force is applied directly to the sizeff. An object is to provide a device which will be simple in construction. In expansive to measuractors, in expansive to measuractors, in expansive to measuractors, described to the provide a device which will be simple in the construction.

Pertaining to Vehicles, WHIFFLERER BOOK.—O. B. Sans, 8068 W. Manning, Settle, Wash. The object here is to provide a look having rischasian for prevaning the accidental discringeness of the trace or tag to long as there is any fault carried on the hook or when the deaft is related, but which may be easily disengaged to release the trace or tag when there is no draft searried on the book.

release the trace or tay when there is no draft exercied on the book.

METALLIC WHEEL—8. H. Soutementation, Winsipe, Mantobe, Canada. This Investible relates more perticularly to a tim construction related that the second related that the second related that the related that the related that the second related to the related

respectively.

BOTTLE HOLDER.—C. N. Sowner, Greatanson, Cobs. This lavestice provides a bottanson, Cobs. This lavestice provides a bottanson, Cobs. This lavestice provides a bottanson between the bottanson between the provides with the provides of the property had and nested in the botta position, and which will at the same time permit the ready removal of the botta; when Gedried.

Nova.—Copies of any of these patents will be furnished by the Scientific Attenuals for ten cents such. Please state the name of the patentee, title of the invention, and date of this paper.

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him until human assistance comes. The performance of the object confesion is more claborate und, characteristically, some-what more spectacular; he obtains possessuch more specialist; in dutains possession of the patient's bat, or helt, or anything that can be runninged out of his pockets, and, carrying this as evidence, first reports to the surgeon and then leads

the way back to the sufferer.

the way back to the sufferer.

Military surgery has now made an
elaborate classification of wounds with
respect to their danger and difficulty of
treitment. For a gueral idea, however,
the accompanying diagram is sufficient,
dividing the wounds according to their dividing the wounds according to their location in the human body, into slight, serious and very serious. This diagram is reproduced from Forgases "Traité de Fathologie Externe." A statistical calculation made by one of the leading surgical authorities of the French gives the reissurgical control of the French gives the reissurgical c tive frequency of wounds not instantan sortal as : slight, 60 per cent ; seri ous, 15 per cent; very serious, 25 per cent. On the whole, the experience of recent wars shows the head and the right arm as the most frequent lodging places of

projectiles.

The greatest difficulty of modern military surgery seems to be in abdominal wounds. Their healing depends on the early application of treatment and on the feasibility of keeping the patient quiet for a, long period. Wounds of this type wrought great havoc in the battle of Spion Kop, where the wounded had to be con veyed down a rocky cliff before undergo regret town a rocky clin terore undergo-ing operation. On the other hand, a large number of Russian soldiers suffering from abdominal wounds at Mukden were successfully treated, with laparotomy, by the skill and admirably organized resources of

#### Atlantic Steamships.

(Concluded from page 473.)
the increase in the motive power, coupled
with this reduction in passenger-carrying
capacity, would render the ship an altogether unprofitable venture for the com

As regards the possibilities of the future it is certain that any of the leading ship-building firms would undertake to build anteed speed of 30 knots. But to guaran-tee that she would be prefitable is alto-gether another question; for it is well understood among shipping men, that, were it not for the very liberal assistance rendered by the British government, in the loan of the capital for construction at the low rate of 2% per cent, and in the payment of an annual subsidy for the "Mauretania" and "Lusitania" of \$750,000

Nevartheeses, we are or one opinion that would be possible, even without government assistance, and by a considerable increase in the passenger rates, to build a So-knot ship which would yield a fair revenue to its owners. The hope for this, at least so far as the operating expenses are concerned, lies in the great promise afforded by the new helical reduction gear, anorest of the new helical reduction gent, Judging from what the battle-cruisers have dene with a straight turbine drive, it is worth consideration whether the re-duction in the weight of engines and boiler plant, due to the use of reduction gear, and plant, due to the use of reduction gent, and the great swing in the coal idli due to the lighes economy of fast-running tur-blese consisted with slow-running propel-iers, would not make it possible to set affost a 50-knot liner, carrying first cablu-passenger only, and whether such a slig-in these days of multiplied wealth, would not attract unfollent first-class passengers, at high sates to make the vayages possib-

Catains: Moster Made by Contribued Machine.—Nathaniel P. Annie of Chicago, Ills. in gatemir No. 1,672,536 describes a constituyal block meshine in which a mold in kinged at its supper color to the



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#### Inspecting Track Scales

(Concluded from page 484.)
pressed on scale manufacturers, freight
agents and other railroad officials, and agents and other railroad efficials, and ablppers and owners of scales on sidings. Further trips of inspection and investiga-tion throughout the United States are soon to be undertaken and the Bureau of Stand-ards hopes to gain information that will lead to the formulation of proper national standards that will be available in any event and more especially should the Gor-ernment by statute or through its Inter-state Comperce Commission seek to constate Commerce Commission seek to con trol and regulate railway weighings. At the same time the work of inspection which will extend throughout the United States, judging from the results already achieved in New England, will result in greater accuracy and efficiency in building and operating railway track scales an important subject in which many rail roads and shippers are now definitely in

## rested. Notes and C and Queries.

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and will be mailed on request

(12877) F G. B. asks: 1. I understand
that two lead balls colliding "head on" would
not rebound. But suppose they collided with
only say 1.10 of their diameters overlapping.
surely they would not come to a dead say, What
only say 1.10 of their diameters overlapping.
surely they would not come to a dead say, what
and central impact of two insists bodies of equal
weight will destroy the momentum of both, and
other resulting velocity of both will be seen. Both
will be brought to rest if I have impact is acscround each other for a part of one turn, and each
will then move off in a straight into stangests to the
dreader are in which they moved around each
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The summer of the collision of the c (12877) F. G. B. asks: 1. I understand hat two lead balls colliding "head on" would

published this year, 1913, is by George F. Chaspers, which we will send for its 3.0 by mail. We recommend both books very highly.

(12878) W. N. G. sakz: When sodium chiecke (NcG) goes him solution, what is the second of the control of the contro

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#### Concrete Pottery and Garden Furniture

By RALPH C. DAVISON, 16mm, 196 po

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The Editors are concerned with live issues, with new achievements. They are anticipating this week what you are going to be thinking about next week.

#### **OUR INTERNATIONAL FUTURE** WILLIAM HOWARD TAFT

Ex-President of the United States, will contribute to early issues of the Independent a series of four articles dealing with the Monroe Doctrine and other great national problems which must be solved by the United States in the near future.

#### WHAT'S AHEAD FOR BUSINESS?

Beginning with the issue of December 25 the Independent will publish a series of srticles in which Independent with photosis a series of strates in windle leading men who know financial, manufacturing, and merchandising conditions from the inside will tell us what in their opinion the year 1914 holds in store for business.

A postal card sent to The Independent, 119 West Fortieth Street, New York, bring to you a supply of the Sixty-fifth Birthday Stamps, enabling you and friends to get acquainted with The Independent on especially favorable to

#### LOOK FORWARD WITH THE INDEPENDENT

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We helped hundreds last year to solve the perplexing problem

What Shall It Be?

You certainly have two or more friends or relatives who are keen motor-who would enjoy reading THE AUTOMOBILE each week. Gift certificates and envelopes are ready for your personal aignature, and will send you as many as you may need.



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TO THE REPORT OF THE PROPERTY OF THE PROPERTY

The yearly price of THE AUTOMOBILE is Three Dollars, but, in accordance with the spirit of the times, we offer you a special price of Two Dollars for each subscription, provided you send us two or more orders.

We will mail the Christmas Number of THE AUTOMOBILE on Wednesday, December 24th, the day before Christmas. In addition, each recipient of your gift will receive in January:

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Will you let us co-operate with you in helping to give at least two of your friends a pleasant surprise and one that will be remembered each week throughout the entire very of 1914?

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SPACE SELOW FOR . FADEL . NAME ONLY

THE CLASS JOURNAL COMPANY, 239 West 39th Street, New York City

FATIOUR AND EFFICIENCY. By Josephine Goldmark, Publication Secretary Na-tional Consumers' League. New York: Charities Publication Committee, 1913. 8v.; 358 pp.; Price, \$2.

remarkable book in every way is this of Goldmark's. It has a distinct advantage such studies as those of Prof. Munsterberg, use it deals with actual and not with labora-conditions. To readers of sechnical journals, conditions. To resource us reasonable of the effects scientific menagement upon workers will bably be most interesting. Her criticisms, must be admitted are decidedly fair. Silises how much can be scoomplished when the control of the control of the companion of the control of remains to sometion are occidently fair. Black remains here until our black on the second and the remains here are the remains the remains and the remains and the Emerson. Taylor and Olivesh type, men who realise that a human being must be treated there. While also Goldmark would not should be climated to the remains the realises the danger than 10 in 'specific qu' when suffish therems almos are sillowed to dominate. But would not should be a sufficient to the remains the same and the line and staff system of Mr. Emerson to the congeving of laborers as well as machines, or as she puts it: 'While Inter-Lies authority or as she puts it: 'While Inter-Lies authority or as she puts it: 'While Inter-Lies authority authority of the lives of mortal men and women status for the lives of mortal men and women status for the lives of mortal men and women status for the lives of mortal men and women status for the lives of mortal men and women status for the lives of mortal men and women status for the lives of mortal men and women status for the lives of mortal men and women status for the lives of mortal men and women status of the lives of mortal men and women status for the lives o

new systems of production?"
There can be no doubt that the factor of unncossary fadages has not received sufficient tures. Frof Irving Pisher has told us that five per cent of all persons in this country are fadigued to a degree sufficient to impair totally their working powers. Surely we have been a serious concords less "Studies such as those trucking owners, surely we have been a factor of the surely support of

hattures to respect the limitations of their operatives.

The Earth. Its Genesis and Evolution. Considered in the Light of the Most Recent Schmidte Research. By A. T. Swains. Philadelphia: J. B. Lippincott Company, 1918. Sto. 27, pp., with St. Sto. 1918. Sto. 27, pp., with St. Sto. 28, pp. 1918. Sto. 27, pp., with St. Sto. 29, pp. 1918. Sto.

United States Official Postal Guids.
July, 1912. Albany, N. Y.: J. B. Lyon
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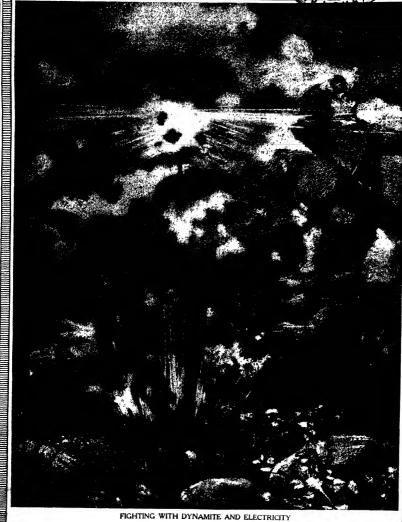
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# SCIENTIFICAME



Founded 1845
NEW YORK, SATURDAY, DECEMBER 27, 1913

Published by Munit & Co. Interpretated therites Allen Munit, President Froderick on your family for return and Pressurer

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#### Munn & Co., Inc., 361 Broadway, New York

The Ritior is always glid to receive to extraminous dibituded articles on solucits of timely orients. If the photographe as solution the articles one and the fine south-orbit is contributions will receive spound attention. Accepted articles will be post for all regular space rates.

The purpose of this journal is to record accurately, simply, and interestingly, the world's progress in scientifle knowledge and industrial achievement

#### The Unsinkable Ship

B ROADLY speaking, there are two ways to suffguard the fires of the passengers another the offreets of serbans cullibran at san. One is to crowd
the upper decks with Hicharts, providing a sufficient
under to accommodate everyone on bourd, the other
le to make the ship. Hs own Hichard by endodying
within it such construction that it is absolutely mediaable As representing the first method, the "Imperator"
is to-day luminered my with no less than eighty-four
Hichards and the new "Augultualle" of the Cumud Line
will come into port next summer with no less than alue
ty-two Hichards on bourd

The Semistric Austraces has currought mutualized that the rational way to breat the question has we to construct every large passenger ship, that he the event of sections have been expected upon the property of the propert

We note with satisfaction that at the twenty first meeting of the Society of Navai Architects and Marine Engineers, held to this city during the present month, distinguished unval architect, George W. Dickle, vice a distinguished manufacture, two got we predefined of the Society, presented a later paper in which he gave the general particulars of a ship build according to these principles. The drawings represent a modern presenger stemmer of about the size of the Protection against slutding is altorded by Thinke Protection against staking is almoded by a double, cellfular upper deck the feet six inches in death, the tower floor of which is located at about the normal water flue, and the upper floor, liconghout the middle portion of the ship, some five and a half feet above this The lower thou throughout the length of the boller stures is parallel with the keel of the slope. Levand the boller spaces it slopes down to a function with the stem forward and the stern off. Its form longitudinally being nerally sludbir to that of the protective deck of a warship. Forward of the boller spaces the accommo dation between the two floors of this waterlight deck is utilized to receive stores of all kinds. Aft of the bolier spaces, the accommodation is utilized for cold storage compariments. Over the todier and engine rooms this space forms what Mr. Dickle calls the 'satchase ment of the hotel part of the ship above." All ventilatbug ducks salt and fresh water males, and drahange olpes are arranged in this space, so that vertical piping only needs to be carried to the rooms above would obvinte the great structural difficulties involved in carrying horizontal piping ducts through the passen accommodations themselves; un improvement which

Mr. Dickle justly considers to be  $^{\frac{1}{2}}$ u very important feature of such u design "

The space between the floors of this upper deck would provide 9,730 tons of buoyancy, which, even if three of the large boller compartments below were open to the see, would still leave the upper thor of the deck materbilly above the water line—if the side of the ship, as rbilly above the water line. If the side of the ship, as lu the case of the 'Thank," were ripped open for a considerable partian of her length, below the lower floor of the upper deck, and the five large boiler compart ments were blied, 14,020 tons would be added to the placement. If the forward holds were flooded and it ary to flood the after holds in order to trip the ship, 3.000 tops of water would enter and the total the sup, 3, 50 1098 of water want erect and the com-amount whilm the slip below the cellular upper deck would be 21,000 tors, which would cause the slip to settle until the water was 0.36 feel above the upper or of the upper deck. To render the sldp safe agr sloking under these conditions, it would, of course, is sluking under these conditions, it wount, or consequencessary to so build her that there should be no it "lutes" or sidelights between the upper and shelter docks, through which water could enter. This difficulty decks, through which water could enter. This difficulty could be avereome by building specially strong sidelights with the class cost around a wire most us a protection against cracking

Mt. Dickle, who sured is an authority, pronounces such a slup mismbable, even moder the extreme conditions of feding flooded from stem to stem below this upper deel. Such microcontrolly, however, is extremely remote. The passengers who stepped ubsard this vased, would do so with the perfect assurance that the calmulty which overwhelmed the unfortunates on the "Hamle" would never overthes themselves.

It should be neutroned that Mr Dickle's plan protibles for the housing of the engineer and holfer-room forces within this double deck, through the center of which a continuous passageway would run, residering possible all needful intercommunication, and obtaining the necessity for staliway openium through the upper deck to the deck above.

ower to the deces are thus briefly outlined is practical. It does not hivide behasion within the ship of unused spaces, it solves the difficulty of pliping and wiring, and it provides an absolutely safe ship. If such constituenton were rendered obligatory by law on all the larger passenger ships. It would work no hardship upon either the indiffer or the owner, and it would remove absolutely and forecer the possibility of another "Pittanic" disaster.

#### Evolution and Ascension

IIE concept of evolution is very commonly assume thated with time of accession, the passage from A closer commitment of this beginning the subset in the health of the hea

There can be fittle doubt that govern1 rules cannot be lath down. The cause of colution will depend upon circumstances. But his of a risk general conditions of control control charge in the star is general conditions of control control charge in the star is provided to be probably as correspondingly constant trend in the cause of evolution. Under constant conditions the control control conditions in the control condition of the control conditions in the control condition of the control condition in the cause of evolution to proceed from shapler to complex forms. We say, as a rule, for there are majorationably exceptions to this, cases which may be described as degeneration, but which invertibles are consistent processed increased in consistent of the control conditions.

represent hereading adaptation to existing conditions. Now the goodnets and pineutotologist trac well acquainted with recruits sudden breaks in the geological recover, overshooted by some comparativity modeln or "outnot tophic" change in the condition of the earth's creat the admission of a continent in the count, our the consequence of hand from the sax, or more or less performed climate changes. Here the conditionary of conditions is broken, and forms of life which had become highly specialized, complex, a prilicularly well adapted to the conditions that had long nevalled, are now less that a geological "unconforming" is mainly compared that it is a production "inconforming" is usually examined to the computated by a sudden change in facel flow and frame, and that in this change the "highest" types are found to have suffered nost.

#### Antivivisection Hysteria

The close of the year which marks the twentyty-fith analysis are of the founding of the Pasteur Institute, It is tuiting to look back and
with grateful appreciation to survey the Institution to
such men as Pasteur, Tyndall, and Lister. We cannot
been attempt in exhaustive account of all the trimphs
liat have come to molletine and surgery through the
discovery of the busterlain ording to firefulous diseases,

and through the aseptic methods and antitoxin therapy based upon this discovery. We must be field to single out a few of the most significant fact Let figures tell their eloquent tale;

MORTALITY AMONG PERSONS APPLICATED WITH SEVERE

	Dinka	BAO,	
Discase.		Before Introduction of and A	After Serum Therapy sepsis.
Rabics Lockjaw Diphtheria Meningitis Plague Puerpecal fever in hospi Compound fractures		About 16 About 80 About 80 About 80 5 to 57	Practically 0 Practically 0 About 8 About 20 0 4 0 1 Less than 1

Ex-President Toft in an address before the Medical clubs of Philadelphin, on May 4th, 1013, stdl. "Of the volunteer regiments mobilised during the Spanish-American war, to per cent became infected with typiold fewer within eight weeks from the date of mobilization. To day, two mouths after mobilization, with modern health regulation and the use of vaccination against typhoid, not one case of typhoid fewer has appeared in the entire force, except that of one tennates, who was not vaccinated."

Recarding the ravages of yellow fewer during the reuse of the disease was understood, we quote from an article by Dr. Crosstein, as published in our issue of November 9th, 1912: "The family of a French chief engineer consisted of five; four died of yellow fever. Of the five members of the family of the superintendent of the railroad, three died of yellow fever. Of the trailroad, three died of yellow fever. Of the trailroad, three died of yellow fever. Of the trailroad, three died of yellow fever. Of thempty-five Nisters of Uncrity who came to Ancon Bospital, twenty died of yellow fever.

Contrast with this two distorting figures, taken from Contrast with this two distorting figures, taken from the first two distorting figures, the first figures fever by the Steen supin mosquite manual and yellow fever by the Steen supin mosquite manual and yellow fever by the steen accordingly: "Prom July 24, 2004, to June 1st, 1905, 77 cuese of yellow fever originated on the latitumes. In June 1905, 62 cueses: In July, 42; in August, 27; in September, 6; in Cother, 3; in November, 2; December (In Cothen), 3. In November, 3; December (In Cothen), 3. In November, 3; December (In Cothen), 3. In Pulm 1906 there was only one case of yellow fever on yellow fever has occurred on the Isthmus, ultimostin a continuous fullings of non-limitimes is taking taken.

We would like to extend this list of triumphs further, but space is lucking, and there is another matter on which we wish to touch. We will introduce it by a few further significant figures.

MORFALITY AMONG ANIMAIS APPLICAND.

Disease	Before Introduction of	After New Mothods
Anthrex		r
Sheep, on certain French farms Cattle, on certain French farms	10	1
Distemper in dogs (Karl Hopf's kennels)	50	
Mailgnant jamidtee of dogs (South Africa)	50-100	Practically 0*

Other discuses of animals which have been successfully attacked by methods built upon Pasteur's work are rinderpost, pleuro-pucumonia of cattle, Texas cuttle fover, swine cryslpcias, glanders, etc.

There are, unfortunately, some Hi-Informed, and, we add without inedution, ill-binned people, who seek to oppose the wonderful progress here recorded because it has been gained through experimentation upon unimals.

To the consideration of the more thoughtful among these we would commend the last quoted figures, which show that animals themselves have amply heavelful from such experhentiation. True, this argument will seem nancepastry to the unblassed reader who has per used the earlier paragraphs of our comments. But we are now speaking to the blassed reader.

As for the hysterical and Irresponsible antivisections, we will attempt no miscoloury work on him (or her), but shall feel that our function is fulfilled when we have warned the other members of the community of the telenomers of the members of the community of the telenomers of the members and attitude and the methods resorted to by such misculded persons. Those who wists to inform themselves in detail on this point are referred to a pampilier by 1r. W. W. Keen, "The Influence of Antivisection on Character," published by the American Medical Association—From this, to illustrate our point, we will merely quote an anonymous letter received by 1r. Keen:

"I have read with horror your article in the Ladies

Home Journal on viviacction.
"I hope your mother, it she is living, will die in the most terrible torture, and it she is dead, that she will never know rest for having given life to such a vile monster as you—is the nightly, prayer of a dozen women who indite this."

This, written to a man who is following in the footsteps of Pasteur, doing the noble work of the medical profession.

#### . .

The Court of the C

the state of Death on Referenda.—A contemporary has residenced that since the average length of a railroad necessary in this receiptry is 86 miles, and a passanger may lake 275,132 with journeys with only one chance of being killed, it would take him, at two trips per day, 8750 years to run the full genut of risk. That is to any, if the one fairly section of the receiptry is the sense fairly security for him to say it the one fairly section to appear of the relational traveling, at two trips per day, in the year 1879 B. C. It must be borne in mind, however, that he snight be killed on his very first trip.

Georgie Washington was as don time suggest in surveying weather to be a first of the modern engineers were the survey of the surveying weather than the present of the modern engineers were the survey of the surveying weather than the survey of the surveying weather than the survey of the surveying traveling to the survey of the surveying traveling to the survey of the surveying traveling the surveys. The attention which has recently been directed to this automate at the survey. The attention which has recently been directed to this automate of the survey.

scottable surveyor. The attention which has resembly been dispetted to this matter has called forth a wide-spread appreciation of the fact that he showed in this work of his youthful days many of those qualities which, in after this, served to make him one of the leading figures of his age.

The Bischned Suy Atlantic Routs.—Discussing the proposed short routs across the Atlantic pin Blacksod Bay, the Shipping World draws attending to the fact that passengers dislike very much the trouble and annayance of any tenenchipment, and American and Canadian traveless are not likely to take kindly to a railway journey across Ireland, a steamer passenge across the Channel, and another railway journey to serous the Channel, and another rulivary journey to their destination. Further, on the reverse journey, passangers will prefer to sunback either at Liverpool or Southamphon to bodge subjected to the innonvenience of going direct to Blankood Bay by train and a coasting teasure. Such a service could not be a success with-out handling a large amount of cargo, and as Blackood Bay is to far removed from the large industrial centers, this class of traffic is not likely to be attracted.

For the Comfect of the Beannes.—The Secretary of the Navy has approved the provision of a reception and reading room for the crew in the case of the U.S.S. "New York," now building at the Navy Yard, Brook-lyn. This consists of a commodious compartment in a location very accessible to visitors. In this room is to be located the crew illinsary, and also room in further to be fitted with reading tables, writing desks, paper and magestee ready, chairs and transom. Ad-jacent to this room are to be larvatory facilities for the nave of guests of the crew. This grouvison for a recop-tion and reading room for the use of the crew and their guests is a -new departure in warship design, and has been desagrated by the Secretary of the Navy for impressing the common of the crew and adding to the attractiveness of the skip for the calisted men and their visitings whis in part. For the Comfort of the Soumen .- The Secretary of e visitors when in part,

their visitors what in park.

Soft Butting Larent-dot. Rivers Plagg, the archi-ters, has done prod service in the criticism before the had done prod service in the criticism before the Lithershopi. Committee of this city, of the antising stalling colds and his negacions as to the framing of Antice invet. The present proposed psycholon of the law is an advanced to make in requirement content to the presents that or the buttledge set. It includes standards of Patigling ander which we suffer at annual the Sam of SI per copies, as compated with the less of colly SI per copies, as compated with the less of colly SI per copies, as compated with the less of colly SI per copies, as compated with the less of colly SI per copies, as contracted against the Statistics and content in the per contents light and only, that offices that he are conferent light and only, that offices that the sequence to be and only that the content of the content of the content of the statement of the content of the content of the content of the second of the content of the content of the content of the second of the content of the content of the content of the second of the content of the content of the content of the second of the content of the content of the content of the second of the content of the content of the content of the second of the content of the content of the content of the second of the content of the content of the second of the content of the content of the content of the second of the content of the content of the second of the content of the content of the second of the content of the content of the second of the content of the content of the second of the content of the content of the second of the content of the content of the second of the content of the content of the second of the content of the content of the second of the content of the content of the second of the content of the content of the second of the content of the content of the second of the content of the content of the second of the content of the con with incombattle with the mought to stead and the stead of the stead o

The like Station of the Desteche Sewarts, as resemblested, mear Hamburg, was almost completely secured by Sea on August 18th.

Pact Harseart is likely so be conspicuous on maps of West Africa in the near future, though the place does not yet exist. The British principal secretary of state for the ecolotie has consented to have his name given to the proposed terminal, at the head of the Boany estuary, of a trunk line of sallway that will run northward from that point for some 400 miles across the essimilar for the proposed terminal part of the second with the Lagos-Baro-Kano system. This line will traverse a fertile and populous district and tap important coal and tin mines.

The Rayal Observatory of Belgium, at Uccle, near Brussels, has been divided into two distinct establish-ments; one devoted to astronomy, together with as-irophysics, geodicsy, gravity, and seismology; the other to meteorology, along with olimatology, terrestrial magnetism, and stumopheric solutivity. The former will be known as the Royal Observatory of Belgium, the latter as the Royal Moteorological Institute of Belgium. The effect of this new arrangement is to give the national meteorological service of Belgium an the national meteorological service of Belgium an independent status, whereas it was formerly merely an appendage of an astro

an appendage of an astronomical observatory.

Disappearance of Two Pacific Lainaña.—Press reports state that Palcon and Hope Islands of the Tongs of Pacific Lainaña.

Disappearance of Two Pacific Lainaña.

Disappearance of Two Pacific Lainaña.

Disappearance of Two Pacific Lainaña.

Disappearance of the Pacific Lainaña.

Disappearance of the Lainaña.

Palcon La

mative kingdom under British protection.

Natural: Baset-praising.—An article by A. Howard in the Appreciation Journal of India describes the attempts made at the Fusa: Experimental Station to protect the protection of the Pass of the India Station to protect the protection of the India Station of India India Station of India India Station of India In

Evaporation During the 1912 Haze.—The henceforth historic "haze of 1912" appears to have registered itself unmistakably in the evaporation records of the great plains and the intermountain districts of our western States. This subject has been discussed in a memoir by L. J. Briggs and J. O. Bels, of the U. S. reau of Plant Industry, on the basis of mee Bursau of Plant Industry, on the basis of measurements made at a number of waporating tanks during the past five years. As compared with the "normal" for its whole period of observation, the average evaporation measured at afteen sistings during the four months following the emption of Katmai was generally deficient, the average reduction amounting to about 10 per cent. This corresponds fairly well with the reduction in solar radiation observed by abbots and Fowle and by Kimbail during the same months.

The Composition of Cows' Milk may be materially modified by the effects of certain drugs which are in common use in medical treatment, such as sodium sul-phate, magnesium sulphate, rhubarb, aloes, and arsenie. phase, magnessum sulphase, rhubarb, aloes, and aremie, according to recent descreteries of O. Lamonin, justilished in La Cifestee Veterisoric. In the writer's experiments all possible precautions were taken to eliminate the indicases of other factors affecting the composition of the milk, such as breed, age, time of milking, feeding, ale, patchedgeal and physiological conditions, etc. Two exceptions and mysiological conditions, one. Two exception of milk space taken from each cow, one before and the orther street the administration of the inadhning. It was from the dark the decreas produce considerable is intensitient to the characteristic contractions of the suffix, which silved its chief nutritive consistents. of the smill, which affect he chief surfaire constituents. The alternibus, andsy consists in the loss of all nutritive property, owing to the playing decrease in the total solids, or many makes the smill; simulable for food, e.g. from an anosis of confin reindering it indigentible. Such milt can such angulation, and should not be suid except for special purposes, and mader the names "medicinal milk."

#### Aeronautics

Another Parachute for Aeroplanes.—The question of parachutes for aeroplanes so as to allow of a safe ent continues to occupy the attention of inventors. Numerous experiments are being carried on in F and it is now stated that a Berlin police lieutenant has invented a new parachute which differs from what has been heretofore presented, for the parachute surface is operated in connection with the wings of the acroplane. On his scheme, a large surface of cloth is rolled up and attached to the wings, this being released by a lever so as to spread out and allow the flyer to descend alowly to the ground.

The Carnegie Museum to Have Rodgers' Transental Aeroplane.—All that is left of the historic t biplane with which Calbraith P. Rodgers flew from the Atlantic to the Pacific two years ago, is to be presented to the Carnogic Museum at Pittaburgh by the late aviator's mother. The machine was badly by the late aviator's mother. The machine was bedly damaged when Rodgers fell to his death in the Paosite Ocean a short time after completing his wonderful flight. Subsequently it was used by Andrew Drew until that aviator also was killed with it. The machine has been restored to its original condition and will no doubt be prized by the museum to which it has been presented. This Wright biplans is the only machine that has flown across the continent of North America. Both Redgert and Powler's Wright machines have motors of but 30 horse-power, yet they flew across the continent in opposite directions at a time when the aeroplane had not been equipped with the 100 horse-power motor of to-day, which makes it much more stable, nor had it developed anywhere near the second of which it has since shown itself to be canable. has been restored to its original condition and will more stable, nor had it developed anywhere near the speed of which it has since shown itself to be capable. Robert W. Fowler, the second transcontinental fire, is at present engaged in making bi-wockly tryps between Oakland and Oroville, Cal., for the purpose of locating brokes wires for an electric power company. An electricism ascompanies Fowler and makes repairs.

Testing the Gas-tightness of a Balloon. The followresults the cust-inguistics of a station. The follow-ing method was used for testing the "gas-ingitiness" of the balloon fabric used in the balloon "Goodyear," which won the 1913 Gordon Bennett Cup. A defantic area of the fabric was placed between the halves of a gas-tight drum and the drum-sections firmly oldamped to-gether, thus forming two chambers with a wall of fabric between. The bottom chamber was connected with a source of highly purified hydrogen, the upper chamber with a compressed air numeric line, and activation source or nigary purned nydrogen, the upper chamber with a compressed air pumping line, and exhausting itself into a combustion train. The gas-tight drum was then immersed in a tank of water, maintained at a definite, unchanging temperature, and hydrogen was admitted to the lower chamber of the drum at a consumired to the lower channer of the druin at a con-stant pressure equal to two inches of water. As the gas diffused upward through the fabric and into the top section of the druin, it was swept out by the air cur-rent and carried through a glass tubo filled with platinrent and carried narrough a gines tube most with piani-ised asbestos hested to redness. This material caused the oxygen of the excess air present to combine with the diffused bydrogen to form water. The water thus formed was absorbed in a sulphuric seed hulb and weighed. By determining the weight of water in a unit of time, knowing the area of fabric under examination, well as the gas pressure and temperature within the drum, it was possible to calculate exactly the number of cuble feet of hydrogen diffused per square yard in 24 hours at the temperature and pressure of the test.

A Novel Experiment in an Aeroplane.—The vertical descent of an aeroplane is a performance which caused some surprise to those who witnessed it at the Buc grounds near Paris. Vicomte d'Autroche is an experigrounds near Faris. Vicomic of Authorite is an oppor-enced military pilot and was engaged in the recent army maneuvers with the aeroplane corps. In the course of the maneuvers he took note of the fact that the seroplane was called upon to spot a certain point on the ground, then pass above this place and let drop a bomb, but it became evident to him that it is very difficult to place the bomb while in rapid flight, and the object could be much better attained should the aero plane remain motionless overhead, or else drop or settle down in direct vertical movement so as to approuch nearer ground. He exercised in order to produce settling down movement, and was soon able to do this; thereupon wishing to prove its possibility he approached Maurice Farman who was at first increduapproached Maurice Farman wine was at mix incremi-lous, for such a vertical descent in flat position had never been seen. But he was able to prove this at the Bue grounds not long ago. When at 3,000 feet height and in a wind of 60 feet a second, he appeared to stop and in a wind of 60 feet a second, he appeared to stop completely in the sir and the propeller turned very slowly. Then the seroplane descended to the ground in the vertical line, but all the while keeping the tenul flat position without everturning. This he repeated several times, and even with a passenger on board. The pilot begins at say height placing himself against the wind, stops his motor and allows the aeroplane to decessed. When 200 feet from the ground he starts the motor and alights as usual. He used a Farman biplane.

#### The Great World Wireless Circuit

#### By J. F. Springer

THE Merconi Company is now engaged in the construction of seven or eight great long distance wireless stations. These will form links in a world telegraphic circuit. One or two in-tervals where land is to be trawed will be covered by means ordinary methods. The re maining intervals where enormous bodies of water he between stations will have long distance wireiess transmission. The sta tions now in contemplation or under actual construction are locat ed in New Jersey, Wales, Egypt, India, Japan, Hawalian Islands and California.

The system of transmission is

that known as the directional, That is to say, the aerials are arranged to extend along the line

of transmission. For example, at Beimar, N J., two straight-line aerials of silicon bronze, each a mile long, will be arranged in parallel straight lines discorded toward the transmission portion of the Welsh station with which communication is to be established. More precisely, these aerials will lie on a great circle of the precisely, these aerials will not a great circle or the earth passing through the two widely separated points. Wireless impulses emanating from Wales will find along this circle the shortest path to their destination. Further, it would seem as if the similarly arranged aerials in Wales would send their strongest impulse along the line of their direction, and that the aerials

at Belmar would accordingly be finely situated to catch the almost exhausted ' as they complete their great 'waves'

Belmar will be the receiving portion of the New Jersey station. The transmission aerials will be located thirty miles away at New Brunswick. However, the hand of the transmitting operator will be at Beimar. Ordinary telegraphic methods Helmar. Ordinary telegraphic methods will be employed to carry the message to Now Brunswick. Here, automatic wire-less keys will transform the Morse mes-sage into a wireless one which will strike out across the Atlantic to the Welsh coust. The dozen of nerials at New Brunswick will be directed also along the shortest path to their objective point. The New Brunswick transmission apparatus is located so far away from the receiving aerials at Belmar in order to reduce by distance their interference with the weak impulses coming in from the Atlantic outo those aerials Further, the impulses going out from New Brunswick will presumably be strongest along the line of their serials and weakest along a line at right angles to it. Now Belmar actually lies on a perpendicular to the great circle passing through New Brunswick and the Welsh through New Influmence and the weish station. We may see then that these loca-tions were not selected at random, but with a perfectly well-defined object in view. By taking a map of New Jersey and laying off a line from New Brunswick in such a way as to make with the meridian



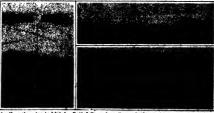
an angle of 50 degrees east of north, and another ru ning from New Brunswick to Belmar, the two lines will be found to be perpendicular to each other; the former lines extending in the direction of the Welsh station.

While the acriais to be held in position are very slight themselves, still the fact that they have to be maintained under tension at a very considerable height imposes serious construction problems. The elevation at Beimar will be about 400 feet above the ground. The six steel masts or towers which will support the little wires will consist of tubular sections, each ten feet high

(Concluded on page 408.)



A battery of grenades exploding



1. How the mine is buried. Dotted lines show the amploding pof bullets after explosion. S. A battery of gr How the Assen grenades are used in warfare.

## Fighting With Dyna and Electricity

#### By Dr. Alfred Grad

A GLANCE at the history of strategy reveals a tendency noticeable in nearly all branches of human activity, vis. : a gra al superseding of the int y collective labor organic ntrolled by a few sun valor, once the most important factor in warfare, has been reduced to a secondary role. The This entenana with the introducti as of r and continued apduring the nineteenth co with the rapid strides made by

with the rapid strides made by engineering. Islice industry, warfare is be-coming more and more mechani-cal. Soldiers are now hardly more than tools in the bands of their capitains. The issue of a sat entirely on numbers and post-

tions. Personal bravery is not of prime importance. In place of it we have something like collective valor, a morale which may to some extent determine victory or defeat

One of the latest stages in this development is the attempt to eliminate the personal element, the soldier, entirely and to substitute for him a machine or automaton. Something of the sort has actually been lit-tempted by a Norwegian engineer, Mr. N. W. Assen, whose "mine greaades" work practically without the help of soldlers, spreading death and destruction every-where. His contrivance is illustrated in

the accompanying diagrams, Fig. 1 show-ing the grenade in position in the field, ing the grando in position in the med, and Fig. 2 at the moment of explosion, representing the spreading of the projectiles. Fig. 3 shows a double shell barricade 1,200 yards long and 100 yards wide, made up of 50 mine grenades joined up in two sets, and which on exploding, sweep an area of 108,000 square yards. Each grenade, inclusive of its accessor-

ies, weighs about 9 pounds, and contain 400 projectiles and about 12 ou an extremely powerful exploan extremely powerful exposure. Im-greande consists of an iron cylinder with a conical point which constants in its in-terior the projective and explosive charge as well as the mechanism consing the greande to rise from the ground and eventually to explode. This mechanism can be set working only by the action an electric current supplied to the great through a flexible cable.

At the bottom of the cylind a small powder charge which by the electric current and win the shell hody vertically thiron a chain, the opp to the cylinder

## Skin Defects in Invisible Light

### A Method That May Have a Wide Application in Medicine

By G. Michaud and F. Tristan, Costa Rica State College

an ter

eer made, hi two different regions of the uniter-ricide spectrum, two large photographs of the head of a man his pears old. For comparison purposes a third photograph was used in visible light and an other in the invisible infra red light of the appopie was of the spectrum. Figs. 1 to 4 show the results of the expectant. The accompaning diagram (Fig. 5) gives, in Amgelvius units, the sanct wave length of light used for each photograph and also the nature of the filter used to select such wave lengths out of direct small select such wave lengths out of the light of the state of the same light. In the livitation infra-red (Fig. 4) as in

In the invisible infra-red (Fig 4) skin In the invisible infra-red (Fig 4) skin descept size comprisons by their sheeped. Every element of the pkin resuch light, and research shout as maps of it as white married does. In fact, if it were not for the black mustache and eystrows, the photograph might be mistaken for the re-production of a sixtuary married head. On Fig 3, made in visible light, we find

the usual and well known dark patches and spot effects, the bete soire of the ama teur portruitist who has not mastered the art of retouching

Doubts might well be entertained as to the practicability of retouching at all if photographs were always the exclusive work of the wave lengths 3 700 -- 4,800 (Fig 2) for there is hardly one square inch of the face which is not covered with a curious network of dark or bright dots or lines forming different figures in differ-ent regions. The general appearance of the photograph is that of an interesting hospital case Considerable difficulty was ex

in getting a fair degree of definition with the uncorrected quarts lens used in the making of Fig. 1 However owing to the very limited extent of the spectrum ad mitted through the silver film and also to the small angle needed neither ans chromatism nor astigmatism were as troublesome as spherical aberration. This

troublescome as spherical aberration. This was partially overcome by a periacopic spectacle quarts lens, the convexity of which faced the object. Absception of ultra violet light by the white size in the neighborhood of \$2,000 Å. U is about what it is for the skin of a negro in visible smulight and black spots are, & \$qse / pace, fores conspicuous ou the darksood Seld. Yet thuy ere much more noticeable on Fig. 1 than on or

are much more no photographa. Carphotographa. Carguirt's lean by 
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sorting powers of animal and plant tissues Such dif-ferences seem to be the rule not merely for proteids but for nitrogenous compounds in general if a number of different alkaloids are photographed through Fouçaults affers film, over one half of them appear as black although all of them may be snow white not only for the eye, but also on a photograph made in visible light

Fig. 2.—Made in ultra-violet light 2700 — 4200 Angström units.

Pig. 1.—Made in ultra-violet light: 3158 — 3250 Angström units.

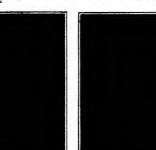


Fig 3.—Made in visible light. 4700 — 5200 Angström units.

3

Fig 4.-Made in unfra red light 7300 - 7800 Angstrom units.

os which absorb and those which reflect uitra violet light, histologists will one day tell us Mean while ladies who wish to improve their looks when at home will do wisely to proscribe blue and violet wall impers and lamp shades and to favor whenever prac ticable illumination of a deep ruby color

#### Radium in Agriculture

A (CORDING to recent experiments in Europe it appears that radium is instrumental in preventing discuses of plants, whence is likely to arise

a new application of this interesting ele ment in agriculture. For several years workers in agronomic science have been experimenting upon the effect of radium upon vegetation by mixing radioactive substances with the usual fertilizers. The numerous results obtained in this work show that most plauts either grain or fl wer are remarkably stimulated and give s better yield both in size and quality this being often seen in the flue and he color f the green plants or leaves I nder the same plants are in better conditi n to resist attacks from various sources of discase such as cause so much damage to crops especially diseases known as crypt) gamic which arise from spores or mold. It seems that radium is to not as a pre-ventive for such discases as wheat rust rotting of potatoes grapevine mildew and many others which cause such detriment to agriculture. Such a result is mly to be expected from what we know as to vital phenomena in general and among others as concerns the human body for all influences that tend to reduce the ltality of the system are likely to leave it a prev to harmful outside influences and infections Such results in the appli-cation f radium in agriculture are likely to be far reaching

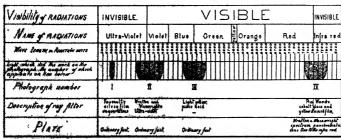
#### A New Study of Anabiosis

T III state in which all vital functions f an organism are suspended with out actual death kn we us us it is has been reciguized f r two certuries past at least as a meerus the lower rders f life and such specimeus can be diled and then recalled to life even after a c reiderable time Is the sile at lon f in lature. A Russian scientist Buchinett f takes up the question as regards light animals. He observes the reason f insects at decreasing temps ratures d wn t 10 deg hel w zero (est at which polit death en such He thought at first that death was due to congelatin f the liquids of the unimal but afterward saw that these con -5 degrees and all the vitai functions then became impossible

runctions then become impossible for all the many shirt, Fig. 1) starth sugar swaath white in such circumstances

What are the anatomical differences between the skin into the starth shareh are the salth of the starth shareh are the skin into the starth shareh are the salth of the starth shareh are the skin in th mens lack t life even after a long time by gradually raising the temperature. He compares this state of lat ent life t a click whose pendulum is stopped but whose

mechinism can be jut in movement by a slight impulse given t the pen dulum M Bach metlef extend ed his researches to small mammi fers such as white mice and bats and nsing artificial respiration these brought to a state low temps ratures such as zero Cent or below. He now intends to experi ment upon rab hits monkeys and even human be-



strom make the exact wave longth of light u tograph and also th

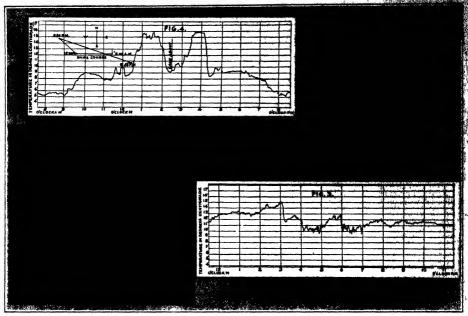


Fig 1—Surface rivitrical resistance thereometer. This consisted of a flat cold of all covered nicket wire inclosed between copper absents and inscisted by this layers of sides. The resistance of the nicket cold was about 100 comes. (Learned by U & Hydrographic Office) Fig. 2.—This layers of sides. Sometimes received was used with the resistance theremoselves was about 00 millimeter. per hour (Lones by U & Hydrographic Office) Fig. 3.—The perture received moving the great and sides of similarity per hour (Lones by U & Hydrographic Office). Fig. 3.—The perture received moving the great and sides of similarity are hour to the control of the contr

## The Autograph of an Iceberg

#### The Thermometer Not a Danger Signal That Warns the Mariner of Nearby Ice

By L E Browne

THE Bureau of Standards has completed initial extrements in solving the hazardous techerg clement accountered in navigating the North Atlantit. Geen during certain seasons of the year Professors C W Mediner H C Dickinson and 1 J Crowe made observations of sea water temperature near techergs and in the open sea with apparatus installed on the United States crubsers. Chester and Birmingham with a view to determining the possibility of detecting the proximity of techergs from temperature records

The apparatus consisted of an electrical resistance thermometer with fish' I had a mid another with 15th foot leads out another with 15th foot leads of the unlimber compensated type with four feathlies silk-evered c lie of itskel wire of 100 ohms resistance. There was a surface electrical resistance made or a flat coil of silk-evered nickel wire inclosed between sheets of copper and insuitated by which sheets of mic A lies others were several mercurial thermometers of the Ns prett and Zambra type loaned by the Bureau of Fluideries if redep set use

A recorder was meanted in the typedo room. This was so carefully laisunced that the records were not influenced by the rolling and itfelting of the ship. Con tinuous records were obtained fr m June 4th to July 10th. The surface thermometer was unused with its dated against the luner surface of the ships % inch plates about six feet below the water line and the whole covered with a thick layer of cotion to eliminate the effect of the warmth of the torpedo room.

For the purpose of defermining whether echoes could

For the purpose of determining whether echoes could be detected from ischerge under water the ship a bell was lowered into the water and struck. Observers statuoed at the submarine signaling reviewes heard several faint echoes. The ship was at a distance of from ne to two miles during the tests. If there ind been time to improve the tnatruments a solution might have been found, founded on the each theory. The camulassion has recommended that it be still further investi

It was found that the effect of cannon fire on leeberg was small. The use of searchlights in locating lergs was determined as practically fattle. Lookouts stationed on deck invariably saw the bergs before men with glasses or in the tops. Water meisted from large chunks of lex taken abourd the Chaeter from a branch aboved that berg lee has great quantities of inclosed air which probably accounts for the bergs withink appearance. The density of this water was the same as that of distilled water. Air temperature observations aboved that the lockery, has very little influence on

the temperature of the sourrounding air
Temperature records showed that the variation in
the warmth of water many miles from a berg is often
as great as that in the vicinity of an icohery. The
commission reports that it will probably be impossible
to establish set rules for detecting icebergs by means
of temperature observations.

The Bureau of Standards party formed the conclusion that the characteristic isothers' effect upon the surrounding water as described by Prof. Barnes was not true. Our records abow an opposite effect to that noted by Prof. Barnes the deposite effect to that noted by Prof. Barnes theory is that there is uniform ity in the rise of temperature of water as the berg is approached and then a sudden drop. The party moted as gradual drop in temperature as the berg was approached from a distance of several railes. The official report of the Bureau party which has been east to navigators throughout the world is in part given in the conclusions below:

If the levelers is constantly drifting into new waters its conting effect on the ocean would be extremely applied from the consideration of the fact that it would sequence the melting of about a million tons of too to cool seasuare mile of open to a depth of 25 feet by 1 deg. Clent. The possibility of extender conting action would require that the berg and surrounding water drift together her considerable distance and that the heation be slow

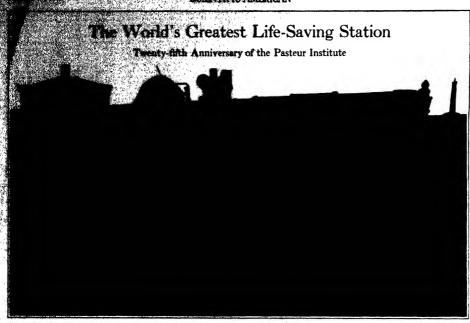
This is probably true under some conditions, but by so means always. Conditions such as these yearler it desirted it any appreciable effect could be distinguished with any degree of certainty at a greater distances than a mile. To account for his beer, Prof. Barner assumes that in regions of the ocean at some distance from the beer pice surface layer, heated by solar refdation, is mixed with the celd water below the 'social vertical circuition, white near the beerg there is a current set up toward the being due to the countines offects of the melting and cooling action. Barnes assumes that this current interferes with the desculation to that the warm water research on top, it is difficult to understand how a sufficiently strong current could be set up by the setting of the beetg to prove they wife the normal circuits. That there is no vary strong current toward, the beetg is proved by the fact that on breaking of the best proved by the fact that on breaking of the large and small chanks of los drift away from the beetg.

"The records of sea water bestperature show that his variations in parts of the open far sensored from helbergs are often as great and spidien as in the seighinghood of seabarm.

being she within in great and spidlen as in the prigitation food of steelers.

"For the majority of the credition of the high jut jut vicinity of the credition of the high jut jut vicinity of the credition of the high price of the price of

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Preparing an antitexin at the Pastour Institute.

II AD we been susmaing up, in the lext issue of the archemital para 1888, the soot significant events of the archemital para 1888, the soot significant events of the archemital para 1888, the soot significant parameters are soon as a summary of the parameter place in our retrospect, which a subsequent twenty-five years' history has so brilliantly sourceded to if? This is the last issue of the year 1918, and we can now look tack, not severy to the founding of the institute, but to a steech of twenty-five years of a most fruitful scitrity. Anyone who should, in 1889, have prophested the successes which have actually been attituded, would probably have been derided as a feature to quote figures that elequently preciaint be victories gained. But it must not be supposed that the list there given is complete or represents all that he been foun. Down where no actual curse have been found in many class the kindridge gained through the list of the second of the control of the second years been continued and reduce death rates. The applies for assuable to that some soulties, and substantive discusse for which he products our true that has of necessary tenerories for the feature of the second years been derided to the possibly amedicate conditions and reduce death rates. The death rate from this has of necessary years been out in but it is none soulties. All administrative discusses for which he products our has a yet been independ a discipling sciences. For the

been Sequel is cleeping alchaese. Test the could annual despit righe from this cause on the Ligardin shope or the Visited annual claim from the count on the Ligardin shope of the Visited annual claim from the Visited annual claim for the Claiman by the sense of the Visited annual claim for the Visit

used light, he soived the problem of the different forms of tartaric acid. By this work on britaric acid, which is a grape acid, he was led to his discoveries in the kingdom of the fernmants. He was at work for more than a quarter of a centrary on the subject of fermentsion; and he introduced great improvements into the methods of brewing, distilling, vinegar making, and wise making. It was well said by Huxley of this part of Pasterie's work, that he had saved France more than enough to pay the indemnity of the France-German war.

man war. In 1965, without leaving off his work on ferments, Pastest took up the study of the silkworm disease, which was wrecking the silk trade of France. After five years of labortous work on this subject, he discovered and proved the infections character of the disease, and was able to restore prosperity to the silk trade.

Next he took up the study of the infective diseases of animals higher than dilworms: anthrax in sheep and cattle, foul cholera, and swine expidelas. His protective treatment against anthrax has by this time antiquarded millions of sheep and cattle against that disease. Reports from France and from Hungary show a reduction of the death rate on many farms from 10 per cent to 1 per cent among sheep, and from 5 per cent to less than 1 per cent among cartle

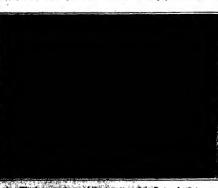
During these years (1870-1880), and for some years

During these years (1870-1889), and for some years before 1870, Fasteur, Lister, Tydall, and other men of acleace in diverse countries, were founding and proving the antiseptic and asspite method of surgery. By this discovery, they canbled all surgeons to save lives and timbs which, before the days of l'asteur and Lister, would have been lost. It is impossible to set a limit to the number of people who owe thoir lives to the work done by Tasteur and Lister.

The preventive treatment against railes was the last of Pasteur's great discoveries. But, iong before he died, bis work was extended all over the world. Between 1880 and 1890 men of science working on Pasteur's lines had discovered the germs of tuberele choiers, in last diphtheria, riphold fever, lockjaw, and Malta fever. In 1893 cmme the discovery of diphtheria autitoxin, and of the protective trement against choiers: in 1894-7, the protective treatments against the discovery of the germs of plague, and of the issues fly discover; in 1895-7, the protective treatments against typhold fever and phague; in 1885-1000, the final proofs typhold fever and phague; in 1885-1000, the final proofs

Sphola sever and peages, in some land peages that malaria and yellow fever are conveyed by special kinds of mosquitors; in 1903-6, Bruse's work on sie-ping sickness and Malax fever; in 1907-10, Fietzner's work on agid-denie meningtists and on spidemic infantilic paralysis, and Earlich's work on the treatment of a widespread contagious disease. These and other life-awing discoveries have been given to the world, as it were, by the hands of Pasteur. Nor is it only men, women, and children who owe their lives and their health to him. The diseases of animals, no less than the diseases of the children of the contraction of the second of the contraction of

He died in 1895. To-day, whether we look at surgery, or at medicine, or at public health and sanitation, or at veterinary surgery—over the whole face of



Photolog saran in one of the storocous of the Pastour Institute.



A rabbit which has been selected for inoculation.



Injecting a horse in order to prapare anti-diphthesis setum.

work lives, and his methods are extended, for the sav-

work lives, and his methods are extended, for ting of human and animal life and health.

As aiready stated, the cure for rables was Plast discovery. When we remember the last discovery when we remember the latture of the discose, we may well imagine wit the horrible

enthusiasm the announcement of the new cure was received. The French Acad-emy of Sciences made an international appeal, in response to which two and a half million francs were obtained by public subscription, and in November, 1888, President Carnot dedicated the institute that bears l'auteur's name.

It is interesting to recall some of the incidents in Pasteur's researches on rables. He was experimenting with rab-bits, and observed that the spinal cord of subjects dead of rables became those-uous after drying for two weeks. He inoculated dogs first with this two-week old vaccine, then with virus 12, 10, etc., days old, and finally with perfectly fresh s, when it developed that dogs sub mitted to this treatment had become immune to infection. After making his communication to the Academy of Medicine Pasteur was stormed with requests to extend his treatment to man. conservative attitude toward this matter is shown by his reply to a letter from the Emperor of Brazil. Pasteur says: "Even after numberless experiments on the action of anti-rables serum with

dogs, it seems to me that my hand will tremble when the time comes to experiment on man." But circumstances forced him to make the trial sooner than he had anticipated. A young Alsacian boy was brought to him, with fourteen bites from a mad dog Only after having obtained the consent of the dean of the Faculty of Medicine and of Prof. Grancher did

On July the 6th, Pasteur take the mon entous step.

reaseur tase to momentous step. On any two visions, 1885, the first vaccination against rables was performed, and the hoy's life was saved. Shortly after the second case was treated, a young shepherd of the name of Jupille, who from that date remained in faithful ser-

vice to Pasteur. Jupille has become a historical figure as is only fitting, for he received his wounds in protecting a group of children from a mad dog, whom he strangled. This episode furnished the subject for an appropriate statue now in the grounds of the Pasteur Institute. The young shepherd is shown struggling

Inoculating a man with anti-rables serum.

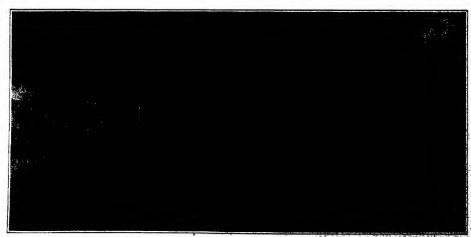
with the mad dog. Strangely seeight years has been deretaker at the shattle published in a French periodical of "gnardian of his own status."

sunate eshough to pleases in this. As an institution that sodily represent America what the Pasteur Inepth to France: The Rocketcler into endowed with almost unitested wand giving opportunity to spen over highest talent to do their shan great work.

institution has been malismed by Among those who know the fi such libels can work no harm, every one knows of the spien accomplished, and we cannot ever praising the efforts made and that suc-cess. The Rocksfeller institute gave birth to the anti-meningiths serum that reduced the mortality of this dread dis-case from 80 per cent to 20. The work on the transfusion of blood there carried out has been the saving of scores of lives. At this institute a method of criss-crossing arteries and veins (which aim always run alongside each other) been discovered, by which impending gangrene has been prevented. In one of the leaflets published in op-

position to the Institute, the writer ex-presses horror at the proposition of the

presses horror at the proposition of the Institute "to build a hospital where experiences may be conducted on human beings." It may be of interest to this author and also to others to know that this hospital was opened in October, 1910, and that the pub-ile have throughed to it in such numbers that thundreds of disappointed applicants had to be refused admission.



The famous monkey room of Prof. Metchall

#### 4

The state of the figure of the state of the

bow squal in brilliance to the day bow, but being at night was very notice

This how completely arched the sky, showing equal spillings at all points. The colors were marked as distinctly as these of the beautiful spectrum with which

writer has talked with a number of people re garding this possible phenomenon and has anybody that had ever before seen its like. non and has not found

.[The foregoing observation of a lunar rainbow is chiefly interesting on account of the distinctness with which the spectral colors were seen. Owing to comparatively feeble illumination such bows do not gener-

ally produce any very sharp impression of color upon the retina, sithough actually the same dispersion of light corurs as in a daytime bow. However, the impression prevailing even among on prevailing even among

tinctly colored is not borne out by sa examination of the files of such journals as the Meteorelogieche Eeltechrift, Symons's Meteorologieche Eeltechrift, Symons's Meteorologieche Megesine, etc., in which many descriptions of these not-ternal phenomena have been published. In fact, this pappeas rather more often than not that a lunar rainhow brilliant and striking enough to be thought worth reporting to the scientific journals is described as show-

Proporting to the Scientific Journal to Security of the Color ing the colors distinctly. It seems immediately to discuss Mr. Nash's observation further, inasmuch as we commented at length on a similar observation a comple of years age. See Scientific American, May 6th, 1911, p. 447.—Ruirea,]

#### The Double Report of Projectiles

To the Editor of the Scientific American:

I was somewhat surprised at a note in your corr e column in the issue for the 18th inst., which states that there is some doubt as to the cracking sound, or sound of a double report, noticeable when a high-velocity projectile passes. This sound, which may seem louder than the report of the piece if the latter is fir from a distance, is only noted in projectiles of a greater velocity than 1,100 foot-seconds, which is about that recovery usual state from the about that of sound waves, and is caused by the builtr passing through the atmosphere. As its velocity is equal to or greater than that of sound, its arrival at a point opposite the heart precedes that of the sound waves it est up at an earlier stage of its flight, and the sharp crack the builet makes is caused at that part of its fight opposite to or nearest the hearer. As it recedes night opposite to or nearest the neares. As it receives from the heaver, the sound waves apparently follow it away from the heaver, and do not come arrongly back to him, and they are diversed set by the relatively more intense sound made by the projectile at the meant to him, and they are diversed out by the relatively more intense sound since by the projectite at the instant it passed him. If, however, the parson noting this physicismon in at shome distinge from the line of flight of the projectile, he hears the acute made by the projectile over a considerable part of its course blending with and following libe (harp report it makes as it passes him, and if his needstile, is surfaciently determi, the report of the projectile so blends with this visitating or rounting sured as to be nearly lead in fig. 12. In the coing of a small belief, the acused much passentials the experience of the projection is observed much in fi. In the coing of a small height, the second much passentials the sangle of a large projectile with goods made in a train is a trained or covered pricipe life, it follows that the same of a large projection will it has presented him; therefore, and is colded the flower own involve status him. A comply infinite is not detent higher flow is present the content of the property of the content of the project of the property of the project of the project

is due to that low velocity, often distorted shape, and erestic dight. In coordigaton I note your correspond-ent's use of the term "steel-jacketed builet." I have been daulified with modeln small arms and ammunition over twelve years, and have used ammunition dating ok as 1896, and have never seen a steel-jacketed as fir hark as 1800, and pure news sould damage and soon spell the lands of the barrel, owing to the hardness of the steel, and thus ruin the rifling. The material used is a cupre-oticle alloy, considering the necessary tough-ness with a texture sufficiently soft to preserve the riding.

G. W. Engranz, First Licutement Fifth Infantry. Platisburg Barracks, N. Y.

#### Tidings from the Poles

THE attainment of the terrestrial poles has, contrary to general expectation, increased rather than dim-inshed popular interest in the subsequent activities of circumpolar explorers. One token of the growing popuof the subject is the large amount d to it in the daily press. Latterly it has become an established custom for the leader of a polar expedition to contract with a great newspaper or group of spapers for a series of detailed reports of his evenuents, to be rendered by cable as often as circumstances permit. Thus the New York Times is the accredited mouthpiece of the Canadian Arctic Expedition, and the New York Tribune of the Crocker Land Expedition. So well is the task of reporting these polar undertakings now carried out, in comparison with the methods of a few years ago, that one is encouraged to hope for still further improvement in the near future.

hope for still further improvement in the near future. For example, it does not seem too much to expect of the great press associations that they should have all news of polar explorations and discoveries edited by an expert geographer before sanding it broadcast over the land. A complemons illustration of what is likely to happen in the absence of this precisition was afforded has October when the discovery of Nicholas II Land was heralded throughout the country as the discovery of an Arctic "continent," or "land as large as Green-The first dispatch from St. Michael, which stated the latitude and longitude in which this discoverg was made, should have enabled the veriest tyro in Arctic geography to recognize as impossible the existarge land mass in the reported location; yet eace or a sigh man mass in the reported location; yet not only did the newspapers all over the United States publish whose columns dilating upon the attainment, by the Russian expedition, of the identical "continent" which the expeditions under Stefanson and MincMillian are now seeking, but they cited in support of these vagaries some presumably much-distorted interviews with polar authorities of the highest rank—who can hardly yet have ceased to blush over the fatuous reattributed to them on that occasion marks attributed to them on that occasion Another curiosity in polar news was the Associated Press dispatch of August 27th, 4918, announcing that Dr. Dou-glas Mawson and five companions had been rescued in a starving condition from Macquarie Island. It would a startying community from an equipment is such a from the extremely interesting to ascertain whether a single newspaper which published this "story" commented editorially upon its manifest inaccuracy, or has since taken the trouble to publish a correction. Mawson was, of course, not at Macquarte Island, where he establi a radiotelegraphic station on his way to the Antarctic, but in Adelie Land, on the Antarctic continent, and could not by any chance have been reached by a relief expedition at that season of the year Again, may we not reasonably ask for a little more

care in the spelling of personal names? Even if mis-takes in spelling are inevitably made in telegraphingand we believe they might easily be reduced to a minimum if verbal accuracy were not so lightly regarded by the newspapers—surely a well-informed editor could by the newspapers—surely a well-informed editor restore most of the bungled names to their correct graphy before they appeared in print.

graphy before they appeared in print.

These is a certain Australasian member of the Canadian Azetic Expedition whose name has, to our knowledge, appeared in eight different forms in press dipatches of the past few months, and some of the spetings are so erroneous as to diagnize effectually this
individual's identity. One need not be a purist to individual's identity. One need not so a purist to demand something better; for there are doubtless some newspaper readers who would like to look up the his-tory and scientific standing of Staffanson's ethnologist —an indispensable prailmanry to which process is to ascertain the gentleman's name!

Balance of Peru TyriHE fragment billeum imported into the United States as believe imported into the United States as believe of Fern a produced by a tree known betanically self signospine persigne known as broad on the Pacific Gear of theoret a merica, known as the flatess Coast, a trace; of land which formerly belonged to Ontennate, The coast was no named because originally balant was the only article that was callected and adapted away from the broad The Fern d and shipped away from that region. The tree

is found growing wild only along the west coast and in some localities it often occurs in dense forests. The balaam was long erroneously supposed to be a product of South America. In the period of Spanish rule, and by the commercial regulations then existing relative to the fruits of the coast, it was usually sent by the rchants here to Callao, Peru, and from there shipped to Spain, which accounts for the name of balsam of Peru, because it was considered indigenous to that region. The real place of its origin was known only to

At the present time balsam is shipped direct from points along the Balsam Coast which extends from Acajutla to La Libertad. The citief wealth of this coast is balsam and the trees yielding it are very numerous and apparently limited to one species, for in no other part of the coast, seemingly identical in soil and climate, are natural grown trees met with. Latterly the tree was introdu ly the tree was introduced into tropical Africa to the East Indies. The balsum tree is said to thrive very well in Kamerun in West Africa A num-ber of small experimental plantations have been started, and it is believed that a very profitable balsam industry will soon be developed there. It was planted as early as 1861 in Ceylon, and with complete success A considerable quantity is yearly collected from trees which were planted near Calcutta, India, and Central America balsam trade is now receiving some competifrom these points.

The manner employed by the Indians of the Balsam Coast in collecting the resin is very crude. Incisions of from nine to ten inches long and about two inches wide are made in the bark of the trunk. The areas made in the bark of the trunk. from which the bark has been removed are wrauped with rags, and the tree being previously heated by a brisk fire around it, or by means of torches, exudes a gummy substance which is absorbed by the rags that are allowed to remain on the naked wood for a few days, when they are removed and placed in a pot of boiling water, which separates the gum from the rags. They are taken out before the water cools, and the realn, which has a greater density than water sinks to the bottom and is collected after the water is poured off. The rags are removed from the water while they are still hot and submitted at once to heavy pressure for the purpose of obtaining the balsam still attached

The baisam is imported in large earthen-ware pote of a pear-shaped form partly covered with basket work, or in tin canisters. The balsam is a thick looking liquid, with a fragrant aromatic odor and taste. It is used in medicine as a stimulant, and also for making spills for lighting candles in churches and for torches

amount and value of imports of balsam of Peru from Central America during the past seven years have been as follows:

Year.		Amount Founds	Value
1905		20,835	 \$17,114
1906		15,747	 10,848
1907		15,303	 11.817
1908		25,021	26.171
1909		25,843	 24,217
1910		50,363	49,132
1911		37,910	 47.840

The tree, which yields the commercial balsam, is about 45 feet in height, and from 12 to 18 inches in diameter at the base. The trunk often grows to the height of from 6 to 9 feet before it puts forth any branches The wood is of a close grain, handsomely veined, nearly of a mahogany color, but redder. It has veined, nearly of a managany color, but redder. It has a very agreeable dotr, which it retains for a long time and takes an excellent pollsh — Balsam wood is highly esteemed for cabinet work, but is rarely to be obtained, aince the trees are seidom felled for the wood they

#### The Canadian Arctic Expedition

THE Canadian Arctic Expedition has not with a ser-I has of misadentures, culminating in the unpremedi-tated separation of its leader, Vilhjálmur Steffusson, with six of his men, from the rest of the "morthern" party on board the "Karluk." It appears that this vessel spent most of August and September drifting helplessly in the ice off the arctic coast of Alaska. On Septe ber 20th, believing the ship fast for the winter, Stefansson and a small party went ashore on a shooting expedition. While they were thus engaged the "Karluk" went adrift in a violent northeast gale, and h since been heard from. Rumors are now rife of diss sions aboard the "Karluk" prior to this occurrence, but the hypothesis that the leader was intentionally abandoned can hardly be taken seriously. Stefansson re-ports that he will proceed eastward to iterschel Island, after leaving an ethnologist and two Eskimos at Harrison Bay to study the natives of that region. During Mackenzie deita, and siedge journeys northward over the sea ice, possibly as far as Banks Land or Prince Patrick Island. the winter he intends to make extensive surveys in the

Kammerlingh Onnes—Nobel Prize Winner
FOR forty years past Kammerlingh Onnes has be
spending his working life in a laboratory specia ratory specially called into being for the production of the lowest tem carried into being for the production or the lowest tem-peratures attainable. For hearly twelve years there has been one goal before him: to liquefy the last ga-which still resisted the greatest cold as yet experi-mentally produced. This gas was, as our readers know,

saion of workers, from Callietet and Pictet (who were the first to liquefy alleged "permanent" games) down to Dewar, who liquefied hydrogen, had carried off brilliant victories in this field of science, but one gaseous element of our pianet still refused to yield to all endeavors to evidence it in the liquid form:

In his cryogenic laboratory at Leyden Kamm Onnes first attacked the problem from the point of view of theory. When his mathematical investigations were complete, he started out on the decisive experimental

By an ingenious arrangement of successive tempera-ture drops or "assender," in effect produced a tempera-ture of -90 deg. Cent. by means of liquid methyl chloride, then -106 deg. to -105 deg. Cent. by means of ethylene. Liquid oxygen then gave hin temperatures extending from -188 to -217 deg. Cent. Hydrogen furnished the next step down to -228 to -250 deg. Cent Not until this point was reached did the By an ingenious arrangement of successive tempera

perations with helium begin. It sed to over 75 atmospheres and coo in a bath of liquid hydrogen, and at -259 de-grees the helium condensed to a bluish liquid, whose temperature, on boiling, fell to -271 deg. This is only two degrees above the abs iute zero which, according to theory, is the lowest temperature attainable hy any means what

Calculations made by astronomers and physi-cists show that the temperature of interplane-tary space is about — 209 deg. Cent., a degree of cold which has thus been exceeded in the laboratory.

At these extremely low temperatures matter no longer behaves as at ordinary temperatures, The electrical conductivity of metals approaches

To produce these extremes of temperature it mry to work with minute quantiti gas and to use excessively fragile and delicate

The estimation of the temperature obtained by the liquefaction and evaporation of helium is somewhat arbitrary, for a reliable gas thermometer cannot of course be found for these conditions. The only means that remains for gaging the temperature is the use of approxi-

gaging the temperature is the use of approxi-mate formula and extrapolation. There would therefore seem to be no gas left on the liquefaction of which physicists should have spent their efforts. However, in the upper atmosphere of the sun a new element has b atmosthere of the sun a new element has been discovered, corunium, whose spectral line appears in the light of the solar corona. It is probable that this element exists, though it has never been isolated in the atmosphere of the earth. Some day this may be accomplished, and the problem of liquefaction will arise anew.

"Little Holland" has every renon to be satisfied with the distribution of the Nobel prizes.

In 1901, the first year they were awarded, a Dutchman, Prof. van't Hoff, received the ch The next year Prof. Lorentz and Prof. Zeemann shared the science prize. The following year again the science prize was awarded a Dutchman, Prof. Vander Wanls. In 1904 Prof. Asser received the peace prize, ils. In 1904 Prof. Asser received the peace prize, this year we once more congratuiste Holland on the trophy won for it by Kammerlingh Onnes

#### To Our Subscribers

WE are at the close of another year—the sixty ninth of the Scientific American's life. Since the subscription of many a subscriber expires, it will not be amiss to call attention to the fact that the sending of the paper will be discontinued if the subscription be not renewed. In order to avoid any in-terruption in the receipt of the paper, subscriptions should be renewed before the publication of the first lesue of the new year.

To those who are not familiar with the Scientific AMERICAN SUPPLEMENT A WORD May not be out of place. The Scientific American Supplement contains articles too long for insertion in the Scientific American, as too long for insertion in the Schertiff America, as well as translations from foreign periodicals, the information contained in which would otherwise be in-accessible. By faking the Schertiffo American and Rupplement the subscriber receives the benefit of a reduction in the subscription price.

#### How Hollow Steel Piles, Compressed Air and Concrete are Employed to Make a Poundation

RAPIDITY of building construction RAFIDITY of building construction is of primary importance in every city of nettopolities arise. When real estate is sold at the rate of several hundred dollars as quare foot it is self-evident that time is indeed money. The delay of a few days in completing a structure may deprive the owner of the chance of serting thousands in rental money. Because of the excessive depth of an open catson, the completion of a foundation may be delayed for months. Hence the building may not be completed until the renting period has a series of the cover may take an entire year before d and the owner must wait an entire year before passed and nee owner must want an entire year occure he can expect any financial return on his investment. Because rapidity is so essential in city building con-struction the method of first sinking an open pit to rock in providing a foundation has been displaced to a large extent by a system in which heavy bollow steel piles are employed in clusters to support a building. The hollow piles are driven through quicksand to rock, cleaned out and ultimately filled with concrete.

In this method of constructing foundations, which In this mernon or constructing roundations, wages is illustrated on the opposite page, below steel plies are driven in the well known manner down to solid rock. The steel plie sections vary in teugth from 20 feet to 22 feet, and in diameter from 12 inches to 24



Kammerlingh Onnes, winner of the Nobel prize in physics for 1913.

If the ground is to be penetrated to a depth greater than 22 feet, the sections of piling are connected by means of a sieve in such manner that a waterlight joint is formed. Under a pressure of 150 pounds to the square inch a jet of compressed air is then employed to blow out the earth and water contained within the shell. A spouting geyser of mud rising sometimes to a height of 150 feet, and occasional large pieces of rock s negation 100 teet, and occasional large pieces or roce-blown up from a depth of 40 feet below the ground, bear testimony to the terrific force of the air blast. When the shell has been completely cleaned out by means of the blast of compressed air, the exposed rock

can be examined by lowering an electric light. Steel sounding rods are employed to test the hardness of the rock and to detect the difference between soft and hard bed rock. After the piles in each pier have been cleaned out, they must be cut off at absolutely the same height netimes a very difficult task when there is little The oxy-acetylene torch is used for the purpos

room. The ory-acceptene torch is used for the purpless, the intensity hot finne cutting off the steel amost like butter at the exact elevation desired.

The hollow shell is next filled with concrete reinforced by means of long two-inch steel rods, semestines fifty feet in length. On clusters of these concrete-dilied plies, the weight of the building is supported.

That this method of constructing foundations is in-

deed rapid, the story of the wark at 145-147 West Twenty-eighth Street, New York city, proves. Rock was located 38 feet below the curb. The material above it

the car are when the was still ten days of Torond the only solution were drawn which and steel plies, driven is read, and stied with constit, and stied with constit, and air, and Stied with rods. Despite various ing of neighboring to was started on June taking out his run foundation bad been o expected arrival of the study.
Such rapid work is not unusual
tion method. On another contra

tion method. On another contract, not in the three menths significant month and a helf, during which be vation had been done, including all driving, the mounting of charges wall, and capping of the piles swally

Sometimes difficulties are emocrated prove all but insurmountable and certification expensive with other methods.

expensive with other mentions. The street from the curb. Two reaching intersected at that point. The piles were sunk through the stream to ro any difficulty.

The excessive cost of open pit work has some-times made it impossible to build twelve or fear-teen-story buildings in many sections of the city of New York. The steel pile has, hou steel building construction profitable.

The carrying capacity of a steel pile is ener-mous. On a single 12-inch steel pile one hunmous. On a single lateness used page on aundred tons can be safely maintained. Piers containing sixteen piles have been sued, and leadings up to 1,300 tons are not unusual.

Naturally the question arises: Do the steel

piles deferiorate in time? The question has been answered over and over again by the piles themselves. After a service of fifteen pairs the steel foundation piles were remained from the site of a building which now minute at the northwest corner of Wall and Resents streets, in York city. They showed practically no de-ration. The oxidation on the outside was al-

#### New York's New Fire Alarm Box System

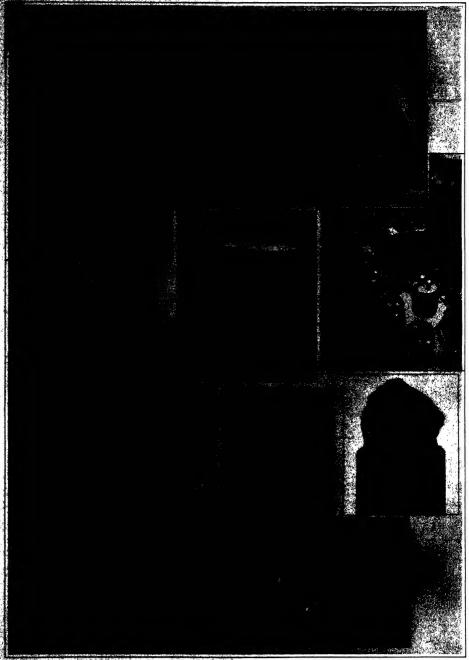
FTER work extending over two years. Mr. A Leonard Day, chief of the Fire Alarm Tele-graph Bureau, and Mr. E. A. Failer, telegraph expert of the Fire Department, have devised a fire alarm box which has been dedicated to the fire alarm box which has been dedicated to the use of New York city without royalty, and it is expected that the cost under competitive bidding, will not exceed \$48. The price of its alarm boxes during the past several years under competitive bidding has run from \$70 to \$875 oct. The average price has been \$129 each. The average price has been \$129 each. The settlanted saving, therefore, will be \$80 per box. The Fire Department experts have distinctly, as only six per cent of the boxes are modern, the rest being obsolete, and many being in an unsets and

even dengerons condition.

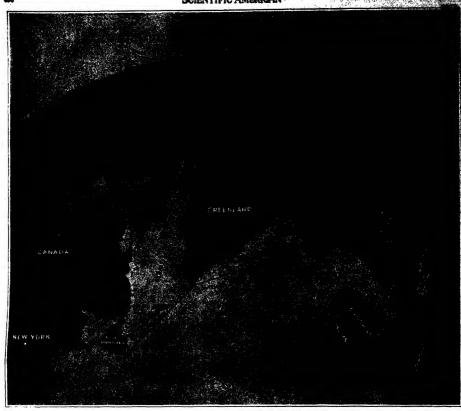
In view of the fact that the new Fire Alarm Telegraph system, including the holated central stations, cables said connections will require the installation of fitteen thousand new bosie in the next five years, it is estimated that the saving to the offy through the weigh which has just been completed will be in round numbers

#### Exterminating Rate

ARFORT from M. de. Kruyf of the Dubth Agrie Arral Bureau at Buttensong, Java, points they to real saccess in rat killing. He tried the mode method of giving a centragious disease to see the hope that all would die. This investment inside Fanality, de Kruyf his upon a normal une of central fields. All visible met higher wines they defined the central fields. All visible met higher wines they defined the central fields. earth to accurring which holes were inhibitists, inhabited holes were build reopened as the fide of th



Using a house some liber sent in the part of the plant age house sweathers from 12 great opens are to be reached, sections of thing are joined together by mouse of the contract of the part of the pa



Map of the North Atlantic Ocean, showing the points for way stations and distances in an aerial relay flight to Europe.

## Way Stations for a Relay Flight to Europe

How the Atlantic Could Be Most Easily Crossed in an Aeroplane

By Henry Harrison Suplee

W 110 can doubt that within a comparatively short time one or more buman beings will have traveled from America to Europe, or the reverse, through the air? Whether this journey is first to be made in a machine which he lighter or heavier than the air through which if moves, does not yet appear, and it seems as if this point depends more upon the mant than upon the machine. The remarkable trip from Parls to Warsaw and return, by Brindelone dee Moullands, was made in an acropiane, while the latest Zeppellin model is specified to have the adulty to remain in the air for three days, and to have a speed of sixty miles an hour. Either machine should be rendered capable of making the attiven hundred miles between Newfoundland and Ireland within a period estimated at from thirty to forty isours.

The elements of difficulty in the undertaking arecomparatively few in number, and of a nature equibit of critical investigation and solution on land, with one or two exceptions, always assuming that sufficient funds are available. For the accopiane the most important thing is the assurance of the reliability of the anotive power, for the diricible it is probably the multitenance of the lightness of the envelope, and the consequent assurance of the ability of the methine to remain in the air for a long enough time. For both machines, however, the human element

For both machines, however, the human element forms one of the indeterminate features; the other one being the possibility of being carried far out of the way by reason of fog and by air currents. Assuming that the problem of motive power for the acropiane is empirior as incution either by improvements in the design of the earlie and extreme ever in its construction, or by the depileration of the motive power machinery is such a manner that the navigation may shift immediately from one engine to the other; and accepting what is sirvedy believed to have been accomplished with regard to the length of time which a dirictible can be maintained affont, we come to the two indeterminate features already mentioned. There is no doubt that the necessary erwe could remain comparison of the control of th

If we turn for a moment to other and far more highly developed machines for transportation, we find that not thought is given to the imposition of any such strain upon the operator, and that it is assumed without question that both machine and man have very definite limitations. High-speed railway trains change both expine and driver every three or four hundred miles, while on occass steamers, where the motive power cannot be relieved, a sufficient number of men is provided to divide the labor igto watches giving ample opportunity for rest and recuperation.

With but few exceptions, those who have discussed

the problem of crossing the Atlantic through the air have feit themselves bound by the precedent of the atennable, and assumed that a continuous and uninterrupted voyage is a necessity. It has aircard been pointed out, however, that it is entirely practicable so to divide the trip as to bring its various portions well within limits of endurance aircard readily sustained both by the man and the matchine.

If we take the attempt as being made from America to Surope, and examine the possibility of molityriding the trip, regardless of thesianes followed by the existing stemminly lines, it is evident that a start from Newfoundard, passing by way of Greenland, Iennal, Farne Jakada, and Norway, would give opportunity for the division of the vorage into four sections, of not greatly differing lengths. Following the presedent of railway practice, and lotting seek section be traversed by mon and machines in reiny, it would not seem impossible practice, and long, for example, to Europic through the send a mail larg, for example, to Europic through the alt, with the apparatus which is even sow; at our disposal. When this has, been successfully accomplished it will be time enough to think about existing out one more of the way stations. This would desaut in the employment of an entire the start was sinch, and in the employment of an entire very operators. Dioblides seem which regards the undertaking in the same light as a neithed would—not appeal in the employment of an interior throat the same light as a neither would—not appeal in the same light as a yeach raw or similar event; but when considered whichly spectures or similar event; but when considered whethy

caninded on year 104.)

T PATERTED INVESTIONS Continue of Spin to all passesses, the continue of the continu

Benefaciaties of Aviation.

Application of the Saven 2015 W. Sething Development of the Saven 2015 W. Sething Development of the Saven 2015 W. Sething Development of the Saven Save

giffed for guickly restoring the contame or guillistytes for the accopiant at any time.

Of Justice to Farrmore,

Of Justice to Farrmore,

FUNDATO SEPALATOR—O. E. Loce, 123

Sound Ava, Studenad, N. Y. The purpose been in the provide a structure which will separate the same sime, and the same sime, and the contament points different show for the same sime, and the same sime, and the contament points different show points on the same sime, and the same sime simple sime simple si

with but one actions in the furrow.

\*\*Commercal Research.\*\*

\*\*SANITARY (NOLDER FOR STRADE OULDESS.\*\*

\*\*A. A. Gustre and F. L. Gustre. acro of the L. D. Cassic Co., Militord. Del. The object of this investion in the provide a device for holding ampiles of causest that are to be used as stands guides on that the later any be in a stands guides on that the later any be in a development of the commerce of the co

The same are of any radius.

The same are of any radius, the same are of the s

Mayburne and Tools.

ANT.—I. M. O'RRILL and W. G. MERTHAM.
Addition James O. Subring, Atty. Coraing, N. X.
This investion relates to news and parties.

Just's to business' same, the aim being to preride a man with means whereby a removable
blade may be readily and quickly attended and
detached, the object being truther to provide
such means as will obviate tha necessity for
the case of extra tools.

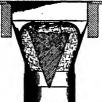
the med of super config turture to provine the med of super configuration. On the med of super configuration and the med of the med of super configuration relates to improvement in oil cans designed for inhelecting purposes, and the object is to provide an improvement in oil cans designed for inhelecting purposes, and the object is to provide an expectation of the medium provided in the configuration of the medium provided in the medium provided in the configuration of the medium provided in the medium provided in the medium provided in the medium provided in the configuration of the medium provided in the configuration of the medium provided in the configuration of the medium provided in the cases when the applies are being direct into the bushings.

HFRING HINGE—O. Karpsussances, care of Lawson Mig. Co., 215 Hinron St., Chicago, and the principles of the medium provided in which case so to wind the same, and is arranged with means for parmitting a free rotation of the head while positively preventing any removal thereof.

Seating and Lighting.

GAS CUT-OFF.—E. T. TRATES. JR., 1807
Wison St., Charleston, W. A. This invention is an finprovement which provides a cat-off-which will asked which will askountfacily close when the pressure falls below a predatermined point, and which will be held closed by the pressure natil it is again opened.

It is again opened.
DUST CATCHER FOR AIR PIPES.—J. W
FOUND, care of Turiey & Turiey, Goodhar Bidg.,
128 N. Court Ave, Memphis, Tenn. This invention relates more particularly to a dust excited to be fitted in an air pipe leading to of from a bot air turner. The device is concaided in the pipe, as for leadance below a cold in the pipe, as for leadance below.



DUST CATCHES FOR AIR PIPES.

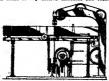
DURY CATCHER TOR ALS PIPES.

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boilding a well known type of ell lamp.

Machines and Machanical Bevices,
CLOKK—4. B. Nondarso, 4213 8th Are,
Rosslip, N. T. This cloth has a boliou terralociding the usual nucleanism with an arbor
in which is mounted another arbor, which
relates in twesty-four hours by genting conwith day and sight house through a sight
with day and sight house through and
on the terrestrial globe may be ascertained by
the markings on the band of any time. Means
provide for determining the time along any
MERT HGIGER.—L. Leasuwere, Box 400.

MERT SLICER.—L. LIMBIRWICE, Box 40
303 Montrose Ave., Brooklyn, N. Y. This in
yeator provides an improved structure which
will quickly and uniformly cut or slice ment
in slices of any desired thickness and retain



MEAT SLICES.

betantially, in a

the sides of the alices to the air, and so that the Subbad piece of mest will remain substantial that the side of the side of



SELF DUMPING BUCKET.

crete in the bacter will bold the dumping doors closed, these doors being at such time directly connected with the boisting mechanism, and wherein means is provided for clamping the backet to the beliefith generalism, after it has reached the place of disposal and has been lowered to it, to cause the breist to move relatively with respect to the doors, whereby to dump the lead.

drow the loads and Their Accessories.

Lot of the Law and their accessories as the condition of the Law and the Law a

ROUNDAMENT to Recreation.
ROUNDAMENT -N J. SHAMMON, care of Lowis Nahemon, 302 Residency, New York, N.Y. The object here is to provide an anneata paperata, in which each car has a plane tary movement, and the several seats on the current leaf different pelycoided or in hypercreation pains, than giving the occupants blighy subparie and sementional ridge.

usury exhopathe and semational rides
HOMS CLAMP - d. Brawdans, non-ville
Couler, N. Thoritown per more particularly to a structure particularly dadpted
for use on automobiles for insuring tight connection of a base with the radiator. The prin
cipal object is to provide a simplified structure
adapted to exert pressure uniformly on the
bow, whereby winking or exclude of the
same is prevented when the parts are in proper
relation.

relation
COMBINATION SLEGGII AND WIJEGELED
VBBIICIA - W E. Wing, 421 Rural Ave., Will
imaport, P. The interactor proteins a sheetel
valides with runners mounted as as to be
soung to a position to cause the wheels to
work onto the ranners lie also provides a
movel uncan of mounting the wheels to better
adapt the vehicle to the arrangement of sleigh
runners

winto MHELD FOR AUTOMORILE RADI ATORS.— A. Holland, Nome, N. D. The pur-pose in this its fance is to provide a device which may be operated either by hand or suto matically for shielding the radiator from the



WIND SMIELD FOR AUTOMOBILE BADIATOR

wind and therefore conserving the heat neces-sary to bring the engine to the best working temperature. The manual means provided for operating the wind shield is especially desir-

that | able in the case of a leaky radiator where the stan-automatic means cannot be used. The engrav-ing shows a front view of a radiator provided with the invention.

with the invention.

DIST CAP FOR THE VALVES.—J. LYNN,
Alice, Tax. In carrying out this invention,
the object is to provide a dust cap which will
not only efficiently serve to protect a vaive



DUST CAP FOR TIRE VALVES,

and its easing as well as exclude all dust therefrom, but which will obvider the disad-santage of caps which must be threaded in place, by providing a separable cap which will require but very few turns to remove or lock it in position by providing means to permit wears normally trading to claim the cap against means normally trading to claim the cap in position.

position.

BPRING WHEEL - J. D. Cutains, Needer,
Cal. This invention refers to improvements in
vehicle wheek, and lass reference more partrusterly to that class of apring wheel which
compriese a plurality of shows and resilient
spokes an associated with the hub as to form a
vehicle apring wheel Moson provide for
preventing any interal displacement of the felly
relatively to the hub.

resistively to the bub
POLDING CHAIR FOR AUTOMORILES.
W. H. Houtdar, err of Healy & Co. 1862
Hondaws, New York, N. The older of the
loweutlon is the provision of a new and im
proved folding chair for use in automobiles,
stranged to be completely out of the way when
folded and to allow of quick and convenient
setting up for use whenever desired

Designa.

Designa.

DRSHGN FOR CARDET OR RUG — J G.

PROEL, eare of G N Nguire, 23 Madison Are,
New York, N Y Mr 'byeel his made four
designs for a carpet or rug bearing the num
bers 44,803, 44,804, 44,805, and 44,800, of
which the first three are based on the pin of
a broad barder sround the conteptere, while
the list has an extremely narrow square corplete is a large mass of bleuded seroits and
flowers.

DESHGN FOR CARDET OR RUG W W.

flowers.

DEBIGN FOR CARPET OR RUG W E
RATER, erre of G N Squire, 25 Medison Ave,
New York, N T This designer bas much comdesigns for carpet or rug numbered 44,001,
44,002, 44,003, and 44,001 All of these designs are distinguished by broad borders and
compact messing of defails in the field instead
of a prominent centrepler except the first,
which has within its borders a large centre.

plece
DENION FOR A DYNIMIC MAT — E. Herr R
RRS, Milwauke. Wis This design shows a
plan and side elevation. The plan is made up
of a series of transpler in rows, the series being
complosed of black and white stripes that represent gradually diminishing traingles within the
outside one. The atranspensent is very effective
and forms a north and strategite mat.

and forms a novel and attractive mat DENIGN FOR A GIGATE INCLOSURE.—H. II ALTROPY, care of Joseph Bernel, Middle Ullage, i. 1, New York to this ornamental design the grave inclosure is of ablong form, squire connect and the bear somewhat broad er than the top Rough atoms effect prodom interes on the exterior and the end is marked by the word "Mother".

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## (Concluded from page 496.)

as a conservative engineering problem, the plan may well be examined upon its merits.

Farewell, Greenland, is a distance of nine hundred and forty miles, this being the longest leg of the trip, and one which might be very materially shortened if a satisfactory starting place could be assured on the coast of Labrador. From Cape Farewell to Reikjavik, Iceland, is somewhat shorter, being eight hundred and twenty miles. These two portions of and twenty miles These two portions of the voyage, the first traversing Davis Strait and the second crossing Denmark Strait, are those in which the difficulties of for are most ant to be encountered although it is possible that the route may pass farther north than the region of enue for.

From Reikjavik to the Furoes is fo hundred and sixty miles, and from the latter it is four hundred and twenty miles ergen, Norway.

This makes a journey of twenty-six hun-dred and forty miles, divided into four fairly equal stages, permitting the diffifairly equal stages, permitting the dim-cuities of endurance, both of man and machine, to be reduced in far greater pro-portion, and bringing the question of fuel supply into altogether managorable shape. It may be said that such a route is allo-gether undesdrable because it begins and and at wholly makes undips and follows.

gether undestrable because it begins an ends at wholly useless points, and follow unsultable places on route. The greathing, however, at present, is to demon strate the possibility of making the cross-ing at all, and this once accomplished, it is probable that important modifications would follow

In any case it must be remembered that it is irade routes which create their own desirability. When all commerce with the Orient was conducted from Venice and Genoa eastward, the commercial import-ance of England was little greater than that of Iceland, and it was the sudden change in the face of Europe, after the new routes to India and America were opened, which placed the British Islands in the front of the commerce of the world. facilities create traffic in all parts of the globe, and when the routes are established they can be depended upon to bring many changes in their train.

In the meantime it may be desirable to sessitate before demanding from the aeroplane and its operator feats of endurance hich have never yet been asked of the locomotive engine or its driver, and be well satisfied that the North Atlantic is apable of division into practicable sec tions for serial payiontic

#### Fighting with Dynamite and Electricity

(Concluded from page 488.)

the enemy. When the grenade is to b fired, an electric current is sent through the cable, whereupon the grenade is projected upward to a predetermined h (generally three fe et), where it explode and simultaneously discharges the four hundred projectiles in a horizontal direction, radially from the center, and parallel to the surface of the ground so as to sweep ihis in its entirety over an area of at least square yards

At a distance of 40 feet the projectile will pierce a timber wall at least 4 inches thick, exerting mortal effects up to 96 Hence this grenade partakes of the properties of the underground mine, explosive shell and shrapnel shell.

At the same time however it offers a number of conspicuous advantages. Since number of conspicuo both the grenade and the cable are buried entirely in the ground, the mine field is hidden so completely as to make detection by the enemy altogether impossible. Moreover, the grenade, thanks to its special design, will always explode exactly at the height most advantageous for the explosive effects Again, it invariably explodes with its longitudinal axis perpendicular to the ground, its four hundred projectiles being thrown out in all directions, parallel to the ground, so as always to insure maximum shooting effects.

Way Stations for a Relay Flight
to Europe
(Concluded from neer Add.)

(Concluded from neer Add.) n during transport mature explor and while being handled and installed. It may even be fired on with ride balls at short range, without being caused to ex-plode. The fuse can mirrover be removed and inserted at any moment.

and inserted at any moment.

Assen grenades are inserted into holes dug in the ground with the spade or yield or with a special drill. In underspining a road, the shells may be arranged along-side the wayside, 20 to 25 yards spart, when the constitution will researched. Instead of connecting up all grenades a given field in series and exploding the simultaneously, they may be arranged in several series, thus allowing a given mine sheld to be fired in several sections. The shells may also be provided in duplicate or in triplicate, so that after firing the first set, the fuses have only to be connected up to the next set of electric cables, to order again to establish the mire field.

Grenades once planted may remain in

the ground for years without suffering any damage. If the mine field be tilled ground, it may even be used for agricul-tural purposes without incurring any

#### The Great World Wireless Circuit (Concluded from page 488.)

Suitable flanges permit the sections to be bolted together, end to end. Further, the ten-foot sections are themselves made up of two parts which are also bolted to or two parts which are also notice to-gether, vertical flanges being provided for the purpose. The boilting up is done when the individual pieces are placed in final position. That is, the towers are erected piece by piece. Some of the secti at other locations are higher than ten fee and have larger diameters than those and have larger diameters than those at Belmar. Sections of large diameter are sometimes made up of four quadrant pieces provided with vertical flanges. The pseces province usin vertical flanges. The metal is comparatively thin, the parts be-ing made of sheets pressed to shape, each piece flanges and all being absolutely with-out seam or joint. At least, this is the type of steel work being used in New

The lower portion of a tower has The lower portion of a tower has a larger diameter than the upper, a tapered latermediate section being used to connect the two halves. At the very top, a wooden mast projects from the hollow steel. This mast carries the supporting arms, which in turn bear the weight and strain of the acrisis. It is used as a help in construction from the time the work reaches the halsth of twenty or thirty feet. From height of twenty or thirty feet. From this point on, it is hoisted up step by step this point on, it is noiseed up step by step of as the construction advances; it is always to be seen projecting above the top of the steel work. The manner of holsting it up from time to time is very interesting. A steel rope is temporarily attached to the appermost horizontal flange of the unfin-ished lower, or runs over a sheave tem-porarily fixed at this point. In the latter case, the rope is carried down to son venient point and secured. From the top of the tower, the rope passes down inside to the bottom of the wooden must when it passes round a sheave and up the oppoit plasses round a sheave and up the eppo-site side to the top of the tower again Hero it passes over a sheave and down the outside to a point near the ground where another sheave permits its direction to be changed to the horisontal. A hoist ing engine winds in the horizontal section and thus effects a raising of the wooder must: When the mast has been lifted the height of a single tubular section, a bar is passed through both steel and wood is passed through both steel and wood At overy one of its positions, the mast pro-vides support by means of four radial arms for the raising and lowering of a kind of movable beloup. The helicopy is moved up and down by the workmen on it, who operate the bjock-and-tockle arrange-ments which connect radial arms and balcony. Standing on the belony, the usen are able to do the hoisting and

seen and now to up any nomining my ing of wheel please and also the hold them in final position.

The towers stand on heavy so foundations, but are not sufficiently founds time, but are not enforcedly strong to maintain rigid positions without or, parall auditation. This is provided by (Countain on page 281)

Automatical and a consumer of the consumer of

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By RALPH C. DAVISON. 16m., 1%

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Making the Farm Pat. By C C Bowsfield, Chicago: Forbes & Co., 1913. 8vo.; 300 pp. Price, \$1.

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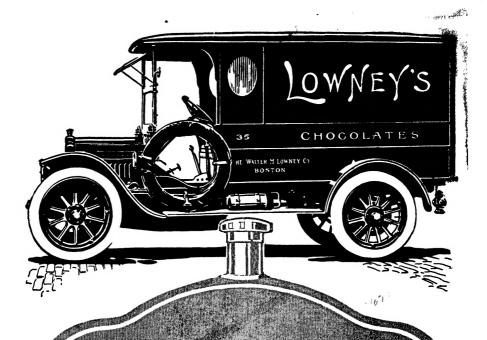
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